State of Maine

Department of Environmental Protection

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2004 Integrated Water Quality Monitoring and Assessment Report

Document Number DEPLW0665

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Chapter 1 INTRODUCTION

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The following report is submitted to simultaneously fulfill requirements of the Clean Water Act (CWA); particularly the Section 305(b) Report, Section 303(d) List, and information requested under Section 314 and also to serve as a biennial report to the Maine Legislature as required under 38 MRSA Section 464.3.A. The Maine Department of Environmental Protection (DEP) assembles these reports with input from many sources and recognizes that the Section 305(b) Report and Section 303(d) List are important ways of regularly communicating information on the health, current status and trends of the State's waters. Prior versions of the 305(b) Report and 303(d) List (compiled and published before 2002) were submitted as separate documents. However, Maine's 2002 CWA/MRSA submission was a significant departure from that earlier format, in that the various requirements from Sections 305(b), 303(d) and 314 were combined into a single document and submitted as an integrated report. Another change in the 2002 report format resulted in the removal of much of the narrative sections on specific program areas and/or recent projects. Likewise, the format of this 2004 integrated report is also somewhat different from either style of previous submissions, in that this current report utilizes the integrated format from the 2002 report, but it also includes updated narrative sections that are similar to those found in pre-2002 305(b) Reports.

Specifically, this 2004 Integrated Report provides:

- Delineation of water quality assessment units (AUs) based on the National Hydrography Dataset (NHD), identified by their 10-digit HUC (Hydrologic Unit Code)
- Water quality attainment status for every Assessment Unit
- Status of and progress toward achieving comprehensive assessment of all waters,
- Basis for the water quality standard attainment determinations for each Assessment Unit,
- Schedules for additional monitoring planned for certain Assessment Units,
- Identifies Assessment Units requiring Total maximum Daily Load (TMDL) determinations and establishes a schedule (priority) for those waters.
- An updated narrative on many of the state's water-related programs areas. The narrative includes a consolidated public health section along with many revised descriptions (e.g. the state atlas, watershed management for stormwater programs and landfills)
- New sections on invasive aquatic organisms, finished waters, the DEP quality management system, among others.

As in 2002, a vital feature of this report is the continued utilization of the five main assessment categories that were first established in the 2002 report (see the section on listing methods for details). As was described in the 2002 document, these new assessment categories required a reordering of the attainment assessment that was different from previous reports and thus may not be readily comparable to pre-2002 reports. In particular, impaired waters that were previously combined into a single 303d list are now separated into a number of lists and sub-lists under categories 4 and 5 in the 2002 and 2004 integrated reports. Although a few of the sub-categories have changed slightly, it is still the case that only those waters that are currently listed under category 5 will require development and submission of Total Maximum Daily Load (TMDL) assessment reports.

Assessment information contained in this report will also be submitted to the USEPA for inclusion into their Assessment Database (ADB version 2.0 or compatible format). The ADB contains information on Assessment Unit and segment descriptions (dimensions, designated uses, etc.), assessment date, monitoring dates, types of information used in the assessment, and if use impairment is determined, the probable causes and sources. However, the current ADB version does not list the assessment category that is provided in the appendices of this report. When fully functional, the ADB will allow for the construction a number of ‘reports’ that summarize information contained in the database. Although, these ‘reports’ provide the basis for a number of the summary tables that are in the different chapters, the tables in this report were created from DEP-generated or DEP-acquired datasets.

One result of the ongoing conversion to the ADB, the adoption of Assessment Units based on the 10 digit HUC, and a general transition to higher quality data with better spatial resolution (e.g. the 1:24,000 scale NHD) is a relative instability in the totals of assessed waters from report to report. An example of this phenomenon is the changing totals of river and stream miles used in this report deviates slightly from that used in previous reports (31,199 miles in 2004, 31,171 miles in 2002 and 31,672 miles in 2000 and before). In addition to changes in the total numbers of assessed miles, some individual segment lengths have also changed slightly based on the improved coverage. Another example of slightly shifting totals for assessed waters would be the numbers of lakes and lake acres since reported from the 2000 305(b) assessment. Changes to these lake figures are contained in this report (e.g. 5,782 currently vs. 5,785 assessed lakes in 2002). Staff in the DEP Lakes Unit expect to see more significant changes in the 2006 report, as the Department completes its migration from a purely tabular database into a spatially oriented database via updated GIS layers. These new GIS datasets will allow for improved management of both locational information and morphometric data and should greatly assist in stabilizing lake-related spatial calculations.

Current guidance for the Integrated Report does not require that the State to provide information on groundwater or wetland resources, as has been the case in previous years. However, Maine has included information on assessment of these resources for many years in previous reports using the 1998 305b guidance document (see Parts V and VI). Updates on progress made towards developing improved assessments of these resources have been included wherever available.

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Section 1-1 DATA SOURCES AND ACKNOWLEDGEMENTS

Sources of River and Stream Assessment Data

The Department generates much of the data for the assessment through the various monitoring programs it conducts, notably the Biomonitoring Program, Surface Water Ambient Toxics Monitoring Program, the Dioxin Monitoring Program, Atlantic Salmon Recovery Plan. Additionally, data is provided from a variety of professional and volunteer monitoring groups. These include other state agencies and resources (Department of Inland Fisheries and Wildlife, Atlantic Salmon Commission, Department of Human Services, University of Maine System), federal agencies (U.S. Environmental Protection Agency, U.S. Geological Survey, National Park Service), other governmental agencies (Saco River Corridor Commission, St. Croix International

Waterway Commission), tribes (Penobscot Indian Nation, Houlton Band of Maliseets) and a number of volunteer watershed groups and conservation organizations working cooperatively with DEP staff and employing state monitoring practices (Watershed councils of the Dennys, East Machias, Machias, Pleasant, Narraguagus, Ducktrap and Sheepscot Rivers, Presumpscot River Watch, Friends of the Royal River, Sheepscot Valley Conservation Association, The Nature Conservancy).

Sources of Lake Assessment Data

The Department's Lake Assessment Section manages much of the data collected from lakes within the state. A strong partnership with the Maine Volunteer Lakes Monitoring Program (VLMP, Inc.) assures the quality and comparability of the data collected through numerous regional entities and local lake associations. Regional entities include Cobbossee Watershed District, Lakes Environmental Association, St. Croix International Waterway Commission, Allagash Wilderness Waterway, Penobscot Indian Nation, Portland Water District, Auburn Water District, Acadia National Park, and Rangeley Lakes Heritage Trust. Data has also been acquired from private consultants (such as Lake and Watershed Resource Management Assoc., Biodiversity Research Institute, Florida Power and Light as part of regulatory requirements) and water utilities that belong to the Maine Association of Water Districts. Additional data is acquired through the Maine Department of Inland Fisheries & Wildlife (DIF&W) and through cooperative projects with the University of Maine System, Colby College, Unity College, Soil and Water Conservation Districts and similar entities.

Sources of Marine Assessment Data

The Maine Department of Environmental Protection (DEP), the Department of Marine Resources (DMR), the Casco Bay Estuary Project (CBEP) and a variety of volunteer monitoring groups monitor Maine's coastal waters. DMR monitors for indicators of human pathogens (fecal coliforms) and biotoxins (Paralytic Shellfish Poisoning). The purpose of the DMR monitoring is to protect human health by managing shellfish harvest areas. DEP monitors toxic contaminants in tissues and assesses water quality using data collected by DEP, especially the Surface Water Ambient Toxics program, and others. DEP participates in the Gulf of Maine Council's Gulfwatch Project that surveys toxic contamination in mussel tissue in the Gulf of Maine. The Maine State Planning Office, the University of Maine Cooperative Extension / Sea Grant, DMR and DEP collaborate in the Maine Shore Stewards Program to provide training, community support, information, grants and education for volunteer groups. The University of Maine Cooperative Extension runs the Clean Water/Partners in Monitoring program, the Marine Phytoplankton Monitoring Program and, with the participating state agencies, the marine Healthy Beaches program. DMR runs the Shellfish Sanitation Program Water Quality Volunteers program that is specifically focused on shellfish growing areas. Friends of Casco Bay monitors water quality in Casco Bay. The Casco Bay Estuary Project (CBEP), funded by EPA's National Estuary Program, also monitors and supports monitoring in Casco Bay and coordinates the National Coastal Assessment for the entire Maine coast.

Chapter 2 EXECUTIVE SUMMARY, OVERVIEW AND ACCOMPLISHMENTS

This chapter will be completed following the public comment process along with final report editing.

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Chapter 3 BACKGROUND

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The introduction to this report alluded to the fact that many state agencies and other organizations are in the (ongoing) process of acquiring spatial data with much better resolutions than was previously available. This is a time of rapid change in GIS-compatible datasets, not only in the resolutions and types of spatial data that are becoming available, but also of a great reduction in the relative costs and speed of data acquisition, particularly in the areas of digital aerial photography and satellite imagery. The introduction also pointed out that these improving sources of data do cause slight changes and shifts in figures that are reported for the lengths or areas of total waters that are assessed during a reporting cycle. This trend is likely to continue and perhaps accelerate at times into the foreseeable future.

Now, a word of caution for the reader, who should be aware of the fact that although the available sources of spatial data that can be used to construct this atlas are improving, none of them are ever completely accurate at every location. For example, in the 2004 Report Atlas (Table 3.1), many of the land cover category areas were determined from a Maine GAP Analysis Land Cover and Vegetation Dataset that was derived in the early 1990s. The smallest unit area used in this dataset covers 900 square meters (or a square 30 meters to a side). This means that areas with a single type of land cover on this order of size or smaller, or a unit area that contains many different types of land cover (e.g. roughly half water and half land) could be misclassified as one or the other rather than both. Then, in the spring of 2005, the state will receive similar data, only this dataset will have a unit area of 25 square meters (a square five meters to a side) and the land cover will be based on data as recent as 2004. In this case, changes between these datasets will come from a difference in the resolution of the data and from the fact that these data were collected over ten years apart from one another, reflecting human-induced changes in land use. So while the following figures are useful in visualizing the composition of the State of Maine, these values should only be considered approximations. The atlas (Table 3.2) from the 2000 305(b) has also been reproduced in this report to allow the reader to directly compare some of the changing figures described above and below.

The State of Maine has a total surface area of over 35,000 square miles – with dry land comprising almost 31,000 square miles and the larger surface waters taking up the remaining 4,500 square miles. And with an estimated population of approximately 1.3 million people, Maine is the largest but least densely populated state in New England. However, since most of the population is concentrated in the southern and coastal portions of the State and into a broad band on either side of Interstate 95, regional population densities are much higher that the states average population density.

From elsewhere in the report, Maine's 5,782 lakes and ponds cover 987,172 acres, an area that is somewhat larger than the State of Rhode Island. There are over 7,000 perennial brooks, streams and rivers in Maine, ranging in length from less than two miles to nearly 200 miles with an estimated total length of 31,199 miles. These water resources are reported in slightly varying numbers in the atlas that follows this narrative.

Recently there has been increasing interest in both international and state borders, so from the atlas below, the St. Croix, St. John, St. Francis, Southwest Branch of the St. John and other rivers, lakes and coastal waters make up almost half (~279 miles) of the ~609 mile-long U.S./Canada boundary. Also, the Salmon Falls, Piscataqua and other rivers, lakes and coastal waters lie on the Maine/New Hampshire line and account for nearly one-third (~60 miles) of the ~189 mile long boundary.

Although there are definitely no complete inventories of inland and coastal wetlands and marshes in Maine, the conservative estimates in this year's atlas approach a total area of almost 3,2000,000 acres. This number does not even include over 7,500 smaller, but known wetlands that are less than 3 acres in size. Also noteworthy, is that at least 1,241 square miles of the state are underlain by significant sand and gravel aquifers.

When queried, the current version of the Geographic Information System (GIS) boundary data layer, returns a value of 5,261 miles of coastline. As with many of the other data sets, this value is also a slight change from earlier reports. The 2000 atlas reported 5,296 coastal miles of shoreline (also based on 1:24,000 USGS maps data provided by the Maine Office of Geographic Information Services (OGIS). This year's estimate was still higher, but slightly closer to the number of coastline miles (5,249 miles) that were reported in the 1998 305b report.

Over 400 river and stream systems, ranging in size from a few hundred acres to over 1,850 square miles, empty into Maine's estuarine and near shore waters. For most reporting purposes, Maine is divided into 6 major drainage basins. Two of these (the Western Coastal Basin and Eastern Coastal Basin) are, in fact, made up of dozens of smaller basins that empty into the Atlantic Ocean. Large portions of 4 river basins extend out beyond Maine and are located in New Hampshire, Quebec and New Brunswick. Tables 3.1 and 3.2 presents this information (as described above) and more in a summary format from the years 2004 and 2000, respectively.

Please note: As was described to in both the Introduction and earlier in this section of the report, sources of data used in developing this report are currently and almost constantly evolving. The number of lakes, reservoirs and ponds, and the acres of lakes, reservoirs and ponds used in this report are taken from the Maine Department of Inland Fisheries and Wildlife (DIFW) Lake Index file rather than from USEPA RF3/DLG estimates. The Maine DEP believes that the DIFW Lake Index file (determined from 15' USGS topographic maps; 1:62,500 scale) provides a more accurate estimate of lake numbers and acres than the USEPA RF3/DLG estimates (based on maps having 1:100,000 scale).

In addition, all of our lake data is referenced by a lake identification number, as is the DIFW database containing lake acreage. It would be a monumental task to link the USEPA RF3/DLG acreage estimates to our database, and this could potentially introduce error due to map scale differences. (However, the base data used to generate lake figures is currently undergoing a change from the DIFW Lake Index to a GIS-based system – DEP Lakes Unit staff utilized only DIFW data for the 2004 report, but expects to be completely transitioned to the new dataset by the 2006 reporting cycle.)

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Section 3-1 STATE ATLAS AND TOTAL STATE WATERS

Table 3-1 The 2004 305(b) Report State of Maine Atlas

Population or Natural Resource Category	Value	Percent
State Population (July 1, 2003 Estimate) *	**1,305,728.0**	**100%**
Total State Surface Area (square miles) *	**35,384.7**	**100%**
State Area – Dry Land (square miles) * [1]	30,861.6	87%
State Area – Surface Water (square miles) * [2]	4,523.1	13%
Total State Area (square miles) [3]	**29,699.2**	**100.0%**
Total Fields (square miles) [3]	**2,297.9**	**7.7%**
Abandoned Field	72.7	0.2%
Blueberry Field	50.7	0.2%
Grasslands (hayfield, pastures)	1,768.9	6.0%
Crops/Ground (includes plowed ground)	405.5	1.4%
Total Forest (square miles) [3]	**26,519.8**	**89.3%**
Clearcut	448.7	1.5%
Early Regeneration	2,017.6	6.8%
Late Regeneration	1,114.1	3.8%
Light Partial Cut	430.0	1.4%
Heavy Partial Cut	577.5	1.9%
Deciduous Forest	4,934.4	16.6%
Deciduous/coniferous Forest	5,139.9	17.3%
Coniferous/deciduous Forest	6,783.7	22.8%
Coniferous Forest	2,960.1	10.0%
Deciduous Forested	392.5	1.3%
Coniferous Forested	1,706.4	5.7%
Dead-forest	14.8	0.0%
Total Scrub-Shrub (square miles) [3]	**725.4**	**2.4%**
Deciduous Scrub-shrub	653.3	2.2%
Coniferous Scrub-shrub	71.7	0.2%
Dead Scrub-shrub	0.4	0.0%
Total Freshwater Wetlands (square miles) [3]	**600.2**	**2.0%**
Fresh Aquatic Bed	0.6	0.0%
Fresh Emergent	326.9	1.1%
Peatland	191.4	0.6%
Wet Meadow	81.2	0.3%
Total Saltwater Wetlands (square miles) [3]	**116.4**	**0.4%**
Salt Aquatic Bed	82.9	0.3%
Salt Emergent	33.5	0.1%
Total Earth-Material Shorelines (square miles) [3]	**152.0**	**0.5%**
Mudflat	93.2	0.3%
Sand Shore	12.6	0.0%
Gravel Shore	17.0	0.1%
Rock Shore	29.2	0.1%
Total Freshwater Surface Area (square miles) [3]	**1,849.6**	**6.2%**
Shallow Water	89.7	0.3%
Open Water	1,759.9	5.9%

Total Saltwater Surface Area (square miles) [3]					**2,273.4**	**7.7%**
Total Residential/Urban/Industrial/Paved Ways (square miles) [3]					**404.4**	**1.4%**
Sparse Residential					261.2	0.9%
Dense Residential					134.5	0.5%
Urban/Industrial					5.7	0.0%
Highways/Runways					3.0	0.0%
Total Alpine Tundra (square miles) [3]					**8.0**	**0.0%**
Total Exposed Rock / Talus (square miles) [3]					**17.2**	**0.1%**
Total Miles of Coastline (including tidal rivers & shorelines of islands) [4]					**5261.0**	N/A
Total Miles of Border Coast, Lakes & Rivers Shared with CA and NH [4]					**338.9**	**100%**
Maine – Canadian Border (coastal water miles out to the "3 mile" limit)					39.4	12%
Maine – Canadian Border (lake miles)					33.0	10%
Maine – Canadian Border (river miles)					206.2	61%
Maine – Canadian Border (total water miles) [4]					**278.6**	**82%**
Maine – Canadian Border (total land and water miles)					*608.7*	*N/A*
Maine – New Hampshire Border (coastal water miles out to the "3 mile" limit)					17.3	5%
Maine – New Hampshire Border (lake miles)					17.7	5%
Maine – New Hampshire Border (river miles)					25.4	7%
Maine – New Hampshire Border (total water miles) [4]					**60.3**	**18%**
Maine – New Hampshire Border (total land and water miles)					*188.8*	*N/A*
Total Miles of Rivers and Streams in Maine [4]					**45,149.0**	**100%**
Miles of perennial streams (subset)					25,617.1	57%
Miles of intermittent [nonperennial] streams (subset)					13,461.3	30%
Miles of rivers (subset)					6,070.6	13%
Miles of Rivers, Streams and Wetland Flowpaths by Stream Order [5]						
Stream Order	*Flowing*	*Intermittent*	*Perennial*	*Wetland Flowpath*	*Total*	*N/A*
1	24,779.08	11,291.27	13,009.22	546.79	27,965.8	100%
2	9,838.34	1,823.24	7,828.66	212.58	12,285.8	44%
3	4,338.84	355.31	3,928.60	65.23	6,986.1	25%
4	1,059.94	68.87	975.64	16.44	3,722.5	13%
5	154.89	12.11	141.55	1.30	1,882.8	7%
6	15.87	2.22	13.70	0.02	1,010.6	4%
7	0.76	0.00	0.76	0.00	246.2	1%
8	0.00	0.00	0.00	0.00	34.1	< 1%
Totals:	*40,187.72*	*13,553.02*	*25,898.13*	*842.36*	*54,133.9*	*N/A*
Miles of Rivers and Streams by Water Class [4]						
Water Class	*Streams*	*(% of Stream Miles)*	*Rivers*	*(% of River Miles)*	*Class Totals*	*N/A*
Class AA	1,369	3.47%	1,274	20.99%	2,643.0	6%
Class A	17,549	44.44%	2,540	41.85%	20,089.0	44%
Class B	20,026	50.72%	1,782	29.36%	21,808.0	48%
Class C	542	1.37%	474	7.81%	1,016.0	2%
Totals	*39,486*	*100%*	*6,070*	*100%*	**45,556.0**	**100%**
Number of Lake, Pond and Reservoir Features in DEP's GIS Datalayer [4]					33,065	100%
Number of Above Waterbodies assigned a MIDAS ID Number (subset) [4]					6,027	18%
Number of Significant Publicly Owned Waterbodies (subset) [4]					2,314	7%
Total Areas of the Waterbodies Described Below:					Square Miles	Acres
Lake, Pond & Reservoir Features the Maine DEP's GIS Datalayer [4]					1,563.3	1,000,527.2
Lakes, Ponds & Reservoirs with an assigned MIDAS Number (subset) [4]					1,518.6	971,885.6

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Significant Publicly Owned Lakes, Ponds & Reservoirs (subset) [4]	1,477.4	945,506.2
Total Area of Bays, Estuaries, Harbors and Tidal Rivers [4]	**2,846.1**	**1,821,473.9**
Total Area of Bays, Estuaries and Harbors	2,717.3	1,739,051.0
Total Area of Tidal Rivers	128.8	82,422.9
Total Area of Bays, Estuaries, Harbors and Tidal Rivers by Water Class [4]	Square Miles	Acres
SeaClass A	211.0	135,009.0
SeaClass B	2,606.3	1,668,047.8
SeaClass C	28.8	18,417.1
Total Area of Wetlands [6]	**4,972.8**	**3,182,563.4**
Estuarine	239.8	153,462.2
Marine	164.5	105,277.1
Total Area of Saltwater Wetlands [6]	**404.3**	**258,739.3**
Lacustrine	1,466.6	938,621.7
Palustrine	2,954.0	1,890,553.6
Riverine	147.9	94,648.8
Total Area of Freshwater Wetlands [6]	**4,568.5**	**2,923,824.1**
Total Area of Mapped Sand and Gravel Aquifers [4]	**1,241.6**	**794,624.0**

* These figures were obtained from 2000 census data, unless otherwise noted.

1. Dry land and land temporarily or partially covered by water, such as marshland, swamps, etc.; streams and canals under one-eighth statute mile wide; and lakes, reservoirs, and ponds under 40 acres.

2. Permanent inland water surface, such as lakes, reservoirs, and ponds having an area of 40 acres or more; streams, sloughs, estuaries, and canals one-eighth statute mile or more in width; deeply indented embayments and sounds, and other coastal waters behind or sheltered by headlands or islands separated by less than 1 nautical mile of water, and islands under 40 acres in area. Excludes areas of oceans, bays, sounds, etc. lying within U.S. jurisdiction but not defined as inland water.

3. As derived from the Maine GAP Landcover Analysis Dataset.

4. As derived from MeDEP's GIS hydrography, geology and state boundary related datasets (Source: Digitized 1:24,000 USGS 7.5" Quadrangle Sheets and Digital Raster Graphics).

5. Draft stream order dataset - as derived from the Maine Office of GIS (MeGIS) 1:24,000 National Hydrography Dataset (NHD).

6. As derived from the National Wetland Inventory (NWI) dataset – based on polygon features only, figures do not include the NWI point dataset that indicates the location of small wetlands.

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Table 3-2 The 2000 305(b) Report State of Maine Atlas

State of Maine: Population and Natural Resource Statistics

Population (Mid-1990 estimate)	**1,227,928**		
State Surface Area	**33,265**	**mi^2**	**100.00%**
Forested Upland	21,262	mi^2	63.92%
Forested Wetland	4,688	mi^2	14.09%
Other Fresh Wetland	3,190	mi^2	9.59%
Brackish/Saline Wetland	246	mi^2	0.74%
Cropland	924	mi^2	2.78%
Pasture	216	mi^2	0.65%
All Lakes and Ponds (5,788 / 987,283 acres)	1,543	mi^2	4.64%
Significant Lakes and Ponds (2,314 / 959,193 acres)			
Other land	1,499	mi^2	4.51%
Area Underlain by Significant Sand/Gravel Aquifers	**1,315**	**mi^2**	
Total Area of Estuarine/Marine Waters	**2,851.6**	**mi^2**	
Linear miles of Ocean Coast	**5,296**	**mi^2**	
Number of Major Drainage Basins	**6**		
Total lengths of rivers, streams, etc.	**31,672**	**miles**	
Total length of rivers	3,704	miles	
Total length of streams	3,909	miles	
Total length of brooks	22,829	miles	
Total length of creeks, etc.	1,230	miles	
Names and mileages of inland border waters (total miles = 272)			
Monument Brook (U.S. - Canada)	11	miles	
Saint Croix R. (U.S. - Canada)	52	miles	
Saint Francis R. (U.S. - Canada)	27	miles	
Saint John R. (U.S. - Canada)	45	miles	
SW. Branch of the St. John R. (U.S. - Canada)	50	miles	
Salmon Falls R. (ME - NH)	30	miles	
North Lake, Grand Lake, Mud Lake, Spruce Mountain Lake, Spednik Lake, Grand Falls Flowage and Woodland Lake (U.S. - Canada)	42	miles	
Umbagog Lake, Lower Kimball Pond, Province Lake, Stump Pond, Balch Pond, Great East Lake, Horn Pond, Northeast Pond, Milton Pond and Spaulding Pond (ME - NH)	15	miles	

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Section 3-2 EFFECTIVENESS OF POLLUTION CONTROL PROGRAMS

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Maine uses multiple approaches to ensure that point source discharges of wastes receive adequate treatment prior to their release to waters of the State. Maine law prohibits any discharge of wastes to waters of the State without a license, and to receive a license an applicant has to demonstrate the ability to provide the appropriate level of treatment. All of the larger municipal and commercial sources of wastewater in the state are licensed and treated, or conveyed to licensed facilities for treatment. A number of financial assistance programs support new facility construction, as well as upgrades or additions to existing facilities.

Many communities in Maine are characterized by low population densities and depend on individual subsurface disposal systems to provide sewage treatment. For areas not served by community collection systems, the Maine Subsurface Wastewater Disposal Rules require that property owners provide adequate means of treating their own wastewater, in accordance with specifications established by the rules. The rules are enforced at the municipal level and administered at the State level by the Department of Human Services.

Most sources of all types of wastewater in Maine, including communities, industrial or commercial businesses, and residences either have installed treatment facilities or discharge their wastes to facilities managed by other owners. The traditional regulatory approach with dischargers is: license compliance inspections coupled with technical assistance in operations and maintenance; enforcement where necessary; and periodic re-licensing.

Water Quality Standards Program

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Related Website: www.maine.gov/dep/blwq/docmonitoring/classification/index.htm

The water quality of Maine is described in terms of physical, chemical and biological characteristics associated with the state's water classification program. As established in Maine statute (38 MRSA Sections 464-470), the classification program consists of designated uses (e.g. drinking water supply, recreation in and on the water, habitat for fish and other aquatic life), criteria (e.g. bacteria, dissolved oxygen and aquatic life), and characteristics (e.g. natural, free flowing) that specify levels of water quality necessary to maintain the designated uses. All State waters have a classification assignment (Rivers and streams: AA, A, B, C. Lakes: GPA. Marine and estuarine: SA, SB, SC).

In some cases, specific limitations are established on certain activities that can occur within a classification, such as types of discharges. Maine's classification system is goal based, that is, it may not necessarily reflect current water quality conditions but rather establishes the level of quality directed by the State to achieve. Maine's classification system should be characterized as more risk based than quality based. The difference in water quality between the various classes is not large, however, the different levels of restrictions put on activities associated with each class establishes levels of risk that water quality could be degraded and designated uses threatened.

In addition to the Maine water quality classification system, the requirements of the Federal Clean Water Act (CWA) establish national goals (designated uses) and interim goals of swimmable-fishable ("wherever attainable ... of ... the protection and propagation of fish, shellfish and wildlife ... [and] recreation in and on the water"). All waters that attain State standards also attain the interim goals of the Clean Water Act.

The assessment listing provided in this report gives the status of attainment of the water quality goals established in the classification program. Thus, some waters may be listed as impaired even though they have relatively good water quality. The reason for this is these listed waters don't attain the quality goals established for their class (e.g. a Class A river may be listed because it does not fully attain the standards of that class but may be of sufficiently good quality to attain Class B or C, and Clean Water Act goals).

The classification program is reviewed every three years by the Department and the Board of Environmental Protection (Board) may, after opportunity for public review and hearing, make recommendations to the Legislature for changes in standards or reclassification of selected waters. The most recent revisions to the classification program were completed in 2002-2003 when changes were made to the provisions for measurement of dissolved oxygen in impoundments. The Legislature also made classification upgrades to 75 river, stream and coastal segments totaling over 800 miles of waters. The Board also completed promulgation of a rule (Chapter 579) that establishes numerical biological criteria for the assessment of rivers and streams. Some of these program changes are discussed further in the report.

Pollution Prevention

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Industrial Pollution Prevention:

The Maine water pollution prevention program (MWPP) continued providing technical assistance to pulp and paper mills. Over the years the unit has helped mills reduce their biochemical oxygen demand (BOD) discharge, use of ammonia, phosphoric acid, and the emission of chloroform.

Municipal Pollution Prevention:

The MWPP program provided DEP and municipal officials with information about effluent quality trends, facility design capabilities, chemical and energy use, and financial status. The objective is to assist in long-term planning and to reduce the potential for effluent violations. The MWPP program helped target technical assistance, establish benchmarks and measure municipal pollution prevention efforts.

Construction of Wastewater Treatment Facilities

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Since the passage of the Clean Water Act, considerable amounts of grant and loan money have supported a very successful effort to clean up Maine's surface waters. Despite this success, there are still significant needs for continued clean-up efforts. These efforts are directed toward upgrading existing treatment facilities, control of combined sewer overflows, and construction of individual on-site treatment facilities. To coordinate activities in each of these areas, the DEP administers multiple programs through its Division of Engineering, Compliance, and Technical Assistance.

In some communities, existing treatment facilities are not adequately treating sewage, due to age of the facility, design deficiencies or operational problems. Excess groundwater or surface water entering sewage collection systems causes sewer overflows, ineffective treatment and/or unnecessary treatment and maintenance costs.

Although most of the larger communities in Maine are served by publicly owned sewage treatment facilities, there are still some areas where domestic sewage is inadequately treated or not treated at all. Such areas may include entire towns, as well as homes, businesses and seasonal dwellings. These communities may also have areas with malfunctioning septic systems and untreated straight-pipe discharges.

State Revolving Loan Program: Federal and State funds for the construction of municipally-owned sewage treatment facilities are administered in conjunction with the Maine Municipal Bond Bank in accordance with the requirements of the Federal Clean Water Act and State law, Title 38 MRSA, Sections 411 and 412. The program is designed to distribute loan funds to communities with sewage treatment problems.

State Revolving Fund: SRF program monies are used to provide low-interest loans (2% below market rates) to communities and sanitary districts to upgrade treatment facilities. The program depends on a yearly Federal Capitalization Grant which must be matched with a 20% State Grant. In 2001, voters approved $2.5 million as the State match for SRF funds. Thirty-two SRF projects were initiated during FY2000 and FY2001 by borrowing over $56 million from these funding sources.

The DEP Municipal Priority Point System: This system is the mechanism used to rate individual projects. The system incorporates five priority categories listed in descending order of relative priority as follows:

1) water supply protection;

2) lakes protection;

3) shell-fishery protection;

4) water quality concerns; and

5) other facility needs

Within each of these priority categories, points are assigned depending on whether the severity of the overall problem is assessed as low, medium or high. The DEP Municipal Priority Point System is described in more detail in the "State of Maine

Municipal Wastewater Construction Program," published annually by the Division of Engineering, Compliance and Technical Assistance. In addition to describing the administrative aspects of the Municipal Wastewater Facilities Construction Program, the above-mentioned document includes the "Multi-year SRF Project list" and the "Additional Needs Project list." The Multi-year SRF Project list includes all projects likely to need upgrades, whether major or minor. The Additional Needs Project list is primarily for areas that presently do not have treatment facilities.

Maine still has a need to make state grants to communities that would have an unusually high annual user charge even with the subsidized interest rate offered through the SRF program. These projects may also receive grants and loan funds from United States Department of Agriculture Rural Development program as well as grants from the Maine State Department of Economic and Community Development. The bond issues that provided the State match for Federal revolving fund capitalization included additional grant funds dedicated for various projects. These projects included funds for new wastewater treatment facilities in the towns of Corinna, Vinalhaven, and Van Buren.

Maine Combined Sewer Overflow Program

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Forty-two Maine communities are served by combined sewer systems, which convey a combination of sanitary and storm water flows to wastewater treatment facilities. During dry weather, all of the sewage in a combined system is conveyed to the treatment plant for adequate treatment. However, during rainstorms or snow-melt periods, stormwater mixes with the sanitary sewage, causing flows that exceed the capacity of the sewer system. This results in combined sewer overflows (CSOs), which vary extensively in pollutant types, concentrations and loads, as well as in volume of overflow and severity of impact to the receiving waterbodies.

Maine has established an aggressive program, coordinated with EPA's CSO program, to assist communities in evaluating the design, condition, activity and effects of combined sewer systems and overflows. As of September 2003, the Combined Sewer Overflow (CSO) Program has provided 25% grants totaling $4,703,297 to support development of forty-two CSO Master Plans or sewer system studies. This represents a total CSO planning effort to date of approximately $18,813,188.

Through these CSO Master Plans, communities conduct studies to determine:

1) the quantity and pollutant loads of CSOs;

2) the impact of CSOs on receiving waters;

3) sensitive areas, where uses are of higher priority; and

4) analysis and recommendation of technologies that will provide a high level of CSO control at a cost that communities can afford

However, it has become clear that the level of CSO control necessary for full attainment of current water quality standards will be very expensive and lengthy to complete. Indeed, several Maine communities have determined through studies of their sewer systems that complete CSO control would cause significant social and economic hardship. Also, most CSO control programs will require terms of up to 15-20 years to complete. Even if a community's recommended plan was to eventually eliminate all CSO problems, water quality standards and designated uses would continue to be violated until the program was complete. This would place the CSO communities in a dilemma. They would be doing all they were financially capable of doing, yet still be violating current water quality requirements. This would leave them open to potential lawsuits by people not in agreement with the recommended CSO Master Plans. Finally, communities need a clear sense of direction and assurance that the actions they take are appropriate and are in full compliance with the law.

EPA has recognized that most States with CSOs have water quality standards that do not adequately address wet weather impacts to the CSO systems and on the receiving waters. EPA's CSO Control Policy of April, 1994, recommends "review and revision, as appropriate, of water quality standards and their implementation procedures when developing CSO control plans to reflect the site-specific wet weather impacts of CSOs".

In response, the Maine DEP proposed changes to Maine's water quality standards and designated uses to allow Maine CSO communities to request from the Board of Environmental Protection temporary CSO subcategories. The new wet weather standards language was signed into law in June of 1995 and became effective in October of 1995. These site-specific CSO subcategories will remove designated uses for short periods of time after rainstorms and snow melt in areas affected by existing CSOs. This will allow communities to continue to make progress in solving the CSO pollution problems without undue financial hardship, and meet state water quality standards. Regulations allowing the implementation of this law became effective on February 5, 2000.

In this report, Maine is proposing to change the listing of CSO-only affected waters from Category 5 to Category 4. See discussion in listing Methodology Section.

Small Community Facilities Program

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In 1981, the Maine Legislature enacted a law designed to allow the State to help finance small wastewater treatment projects. The law authorizes the Department of Environmental Protection to award grants to help fund the construction of small wastewater treatment facilities, including individual septic systems. In the case of individual septic systems, DEP can pay from 25% to 100% of the construction costs. The maximum project cost funded by the program is $100,000 per year for each town. Projects are reviewed for their priority under a system very similar to the Municipal Priority List and then selected from the resulting list in descending numerical order. Funds for this program are usually provided from bond issues approved by Maine voters. The Small Community Facilities Program was last funded for the 2004 construction season by a $500,000 bond issue that was approved in November, 2003.

This program fills a need which is largely unmet by the State Revolving Fund Program. It allows the Department to clean up scattered small-scale problems by

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funding installation of individual or cluster treatment systems in a very cost-effective manner. During the twenty four year period the Small Community Facilities Program has been in existence, grants totaling $23 million have been authorized for funding under this program, allowing the replacement of systems in over 300 communities. As a result of these efforts, significant benefits have accrued, including the elimination of public health threats and the reopening of a number of shellfish growing areas to harvest.

Licensing of Wastewater Discharges

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The Division of Water Resource Regulation is responsible for the licensing and re-licensing of all surface wastewater discharges, whether industrial, commercial, municipal or residential. In Maine, the vast majority of wastewater discharge sources have previously been licensed. Therefore, the licensing program is focused largely upon renewal of existing licenses, rather than development of new licenses. As of 12/31/03 there are 202 non-POTW licensees (includes industrial, commercial, cooling water and misc. sources), 169 POTW licensees, and 1,658 Overboard Discharge licenses or conditional permits for sanitary discharges from residential and commercial sources.

As described below under *New Program Areas: NPDES Authorization and Emerging Issues,* Maine was authorized to implement the NPDES program in January of 2001 and has made tremendous progress in issuing permits.

Wastewater discharge limits in the State are based upon two criteria: 1) a standard of performance of technology or level of treatment provided for a specific wastewater or pollutant, or, 2) the level of treatment required to provide protection for the water quality standards of the receiving water. When developing license limits, the more stringent of these criteria is used in the license. Most effluent standards and criteria are the same as those under the Clean Water Act (CWA).

The Clean Water Act established national "standards of performance" for the control of pollutant discharges from all sources. Section 301 of the CWA required that, by 1977, all point source discharges of "conventional" pollutants be treated by the application of best practicable control technology. The Code of Federal Regulations, in Title 40, establishes these technology-based effluent limitations which serve as the minimum licensing standards for point source discharges.

Municipal and industrial dischargers of wastewater containing toxic or hazardous pollutants are required to apply "best available control technology" in order to achieve effluent limitations established pursuant to Sections 301 and 307 of the CWA. The Administrator of the EPA publishes additional guidance in the form of effluent limitations and standards of treatment efficiencies for the control of specific pollutants from categories of discharge sources. Effluent limitations for toxic and hazardous pollutants are included in Maine Pollutant Discharge Elimination System (MEPDES) permits for industrial or municipal dischargers as needed. In early 1995, the Department began implementing the requirements of Maine's Surface Waters Toxics Control Program, which requires effluent testing for whole effluent toxicity (WET) and priority pollutants and many industrial and municipal treatment plants. The program is set forth in Chapter 530.5 of Department rules.

Municipal Wastewater Treatment: The CWA requires that discharges from municipal treatment systems receive secondary treatment (providing 85% removal of conventional pollutants), except where water quality concerns require more stringent limits. The only exception to this requirement is a variance under Section 301(h) of the CWA, allowing primary treatment where the dilution ratio and depth of the water allows rapid mixing of the effluent into the receiving water. Maine has twelve municipal facilities discharging under primary variances; all discharge into the ocean or into waters with high-volume tidal flows.

Municipal licenses include requirements to disinfect at least seasonally due to the possibility of discharging pathogenic micro-organisms. Because most municipal dischargers use chlorine in some form to disinfect, limits for total residual chlorine are included in many municipal licenses. Municipal licenses also include requirements to monitor CSO activity and to develop plans for control of these overflows. Many municipalities accept wastewater from industrial or commercial facilities either with or without pre-treatment. Appropriate pretreatment requirements are included in the municipal license where an industrial source contributes 10 percent of the flow to the municipal facility and discharges a pollutant that has a categorical standard.

Industrial Wastewater Treatment: A wide variety of industries in Maine use processes that result in the generation of contaminated wastewater. The chemical and biological constituents of wastewater from Maine's industrial point sources are as varied as the industries themselves and include everything from wood fiber to shrimp wastes to metallic compounds.

Industrial dischargers in Maine are regulated in two ways: 1) the industry discharges to a municipal sewage collection system; or 2) the industry discharges directly to a receiving waterbody. Industries which discharge wastewater to publicly-owned sewage treatment facilities are required to pre-treat wastes which would otherwise interfere with the operation of those treatment facilities, or which would not be adequately treated by the municipal treatment process. The pretreatment program is administered by the DEP, which conducts pretreatment inspections and provides assistance to municipalities in understanding pretreatment issues and in developing local limits on wastes to be discharged.

Elimination of Licensed Overboard Discharges

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From the inception of its wastewater discharge licensing program, Maine has issued licenses to individual homeowners or businesses, or to small cluster-type treatment systems, where existing lots were unsuitable for subsurface disposal and no municipal system was available. This ultimately led a large number of licensees (more than 2900 in 1987), which made it impossible for DEP to adequately monitor compliance or evaluate re-licensing applications. Also, the large number of small overboard discharges (OBDs) eventually led to closures of a significant number of shellfish growing and harvesting areas.

Due to concern over the effects of the burgeoning number of licensed small point source discharges, the Maine Legislature passed an act (the "Overboard Discharge Law") in 1987, which prohibited new discharges of non-municipal sanitary wastewater. In 1989, substantial changes were made to the Overboard Discharge Law. These changes prohibited new discharges and expansions of existing, licensed discharges, required DEP to inspect all OBDs each year, established an inspection fee to fund the inspection effort, and established the OBD Removal Grant Program. The priorities of the grant program are to eliminate discharges that either cause the closure of shellfishing areas or that cause a public nuisance.

The Overboard Discharge Laws were amended again in 2003. These new changes require the removal of all overboard discharges if a technologically proven alternative can be found. The grant funding mechanism was also changed to allow grants of 25% to 100% of system costs, with the grant percentage dependent on income. Newer technologies have made it possible to install non-discharging systems on difficult sites, and it is anticipated that ultimately 50 percent of the approximately 1,658 licensed overboard discharges in the state (at the end of calendar year 2003) will eventually be removed.

The OBD grant program has helped open over 16,000 acres of closed coastal waters since 1991 by removing over 300 discharges at a cost of under $6 million. These opened areas contain fish and shellfish with a potential retail value estimated to be $40 million, if they were fully utilized. This figure comes only from these potential harvests of fish and shellfish and does not take into account the many other benefits of cleaner, healthier waters.

Compliance Evaluation

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Related Website: www.maine.gov/dep/blwq/docstand/wastepage.htm

The Department uses a three-part program to evaluate the compliance of wastewater treatment facilities. The compliance evaluation program involves on-site inspections of wastewater treatment facilities, occasional sampling of their effluent quality on a selective basis, and monthly evaluation of the licensees' self-monitoring reports. Discharge licenses also require immediate reporting of any major malfunctions, bypasses or exceedences of license limits to DEP inspectors.

The intent of the inspection program is to foster voluntary self-compliance and to encourage licensees to be aggressive in attaining optimal operation and maintenance of their treatment facilities. During a NPDES compliance inspection that utilizes EPA Form 3560-3 (known within DEP as a "3560 inspection") or other types of thorough inspections, all major areas of the treatment facility are inspected to ensure proper operation and maintenance, including treatment equipment, pumping systems, self-monitoring records, process control and laboratory testing procedures. In addition, several routine state inspections are done between the more thorough "3560" type inspections to insure that proper operation is continuing. These state inspections are usually less intense than the "3560" type of inspection and focus on specific plant problems, operator assistance projects and other compliance follow-up activities. Unlike the "3560" type of inspection, these routine state inspections are usually not announced so that a better idea of a plant's normal day-to-day operation can be ascertained. Effluent samples are sometimes collected for analysis by the DEP to ensure that the self-monitoring efforts by the licensees, accurately represents the typical condition of the effluent.

An important part of the inspection and compliance program is monthly Non-Compliance Review (NCR) meetings held by the DWRR. At these meetings, representatives of all regional DEP offices, the licensing section, the enforcement section and DECTA discuss specific compliance problems at licensed treatment facilities and decide upon specific courses of action. Possible responses to compliance problems range from monitoring the situation to providing technical assistance, providing engineering design reviews, funding upgrades to treatment facilities, up to formal enforcement action. The NCR process has improved consistency in addressing compliance problems, has helped foster voluntary compliance, and has facilitated the referral of appropriate violations to the enforcement section. In addition to monthly NCR meetings, Quarterly Noncompliance Review (QNCR) meetings are held with EPA to discuss and coordinate actions regarding waste water treatment problems.

The Department provides an inspector to serve as a Pretreatment Coordinator. The pretreatment program is administered by the DEP, which conducts pretreatment inspections and provides assistance to municipalities in understanding pretreatment issues and in developing local limits on the wastes to be discharged.

The DEP also provides inspector coordination and laboratory problem resolution for the annual EPA Discharge Monitoring Report (DMR) Quality Assurance Studies. In these studies licensed facilities are required to analyze QA control samples for their discharge parameters to determine if their ongoing self-monitoring testing data reported on their Discharge Monitoring Reports is accurate. Inspectors work with the licensees or their contract labs to correct any unacceptable results.

Technical assistance is also provided to the operators of wastewater treatment facilities. In addition to responding to requests for assistance with specific problems such as sludge bulking and odor control, programs are conducted which take a more systematic approach to improving wastewater treatment operations by examining all aspects of treatment plant design and operation.

Operations Management Evaluations (OMEs) are done to diagnose license compliance problems and to provide on-site operator training. OMEs are focused on operation and maintenance problems including process control, personnel and financial management. OMEs result in recommendations for procedural changes as well as follow-up operator training targeted towards improving wastewater treatment. DEP conducts six OMEs per year on a "worst-first" priority basis.

Maine requires that chief wastewater treatment plant operators be certified by the DEP through a certification process that consists of qualifying examinations for five levels of certification for biological facilities and three levels of certification for physical/chemical facilities. The smaller municipal facilities can have a Grade I operator in responsible charge, while the larger and/or more complex facilities must have a Grade V operator in responsible charge.

Investigation of Citizen Complaints: During the past two years, the DEP Bureau of Land and Water Quality have investigated numerous citizen complaints concerning discharges to the waters of the State. Many of these cases required field investigations and extensive follow-up work to achieve eventual compliance with discharge laws. A number of these complaint investigations have led to enforcement actions.

Enforcement of Water Quality Laws

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The general philosophy of the DEP, Bureau of Land and Water Quality (BLWQ) is to gain compliance and resolve problems at the least formal level that is appropriate, and to maximize the spirit of cooperation between the DEP and the regulated community. By fostering voluntary compliance with Maine's water pollution control laws, the overall effectiveness of the enforcement program is maximized and unnecessary litigation is avoided.

Formal enforcement actions become necessary when violations of environmental laws are severe enough to warrant action regardless of the remediation effort; or when the violator is not responsive in preventing violations or refuses to cooperate with the DEP. Formal enforcement actions originate both from license or permit violations, and from detection of unlicensed activities through complaint investigation or other fieldwork. The Department's enforcement priorities have generally been based on the size of the violations, the potential for environmental harm, the recurrence of violations and the precedents involved.

The Division of Water Resource Regulation is responsible for all formal enforcement actions regarding wastewater discharges that are taken by the Bureau of Land and Water Quality. The divisions of Water Resources Regulation and Land Resource Regulation in the BLWQ share enforcement of non-point source pollution regulations. Other agencies such as the Land Use Regulation Commission in the Department of Conservation and local code enforcement officers also are able to address land use problems which lead to non-point source pollution. Time is also dedicated to sanitary surveys and remedial actions needed to identify and remove discharge sources that are contributing to the closure of shellfish harvesting areas or that are otherwise impairing water quality. Finally, considerable effort is put into assuring that compliance schedules and programs resulting from enforcement actions are properly implemented.

New Program Areas: NPDES Authorization and Emerging Issues

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Related Website: www.maine.gov/dep/blwq/docstand/wastepage.htm

NPDES Authorization: On January 12, 2001, Maine received partial authorization from the Environmental Protection Agency (EPA) to implement the National Pollutant Discharge Elimination System (NPDES) Program. EPA withheld its decision on contested areas of the state in the upper Penobscot River watershed and certain areas in the St. Croix River watershed. On October 31, 2003, EPA granted authorization in these contested areas with the exception of two tribal facilities with discharges. EPA will retain the authority for the NPDES permits for these facilities. With this limited exception, the Department is now the primary authority for administering the Clean Water Act in Maine. It is noted that this final EPA decision has been appealed by both the Maine Tribes and the Maine Office of the Attorney General. The program is referred to as the Maine Pollutant Discharge Elimination System (MEPDES) program.

As part of the authorization process Maine adopted rules (Chapters 520-529) that became effective upon authorization of the NPDES program. These rules are available at the following URL: www.state.me.us/sos/cec/rcn/apa/06/chaps06.htm and they cover all aspects of the permitting program.

Due to historic understaffing in the Department's waste discharge licensing program, a backlog of expired license applications developed, resulting in numerous dischargers operating under expired discharge licenses. As part of the NPDES authorization process, licensing staff was increased (current number of staff is 4). An aggressive schedule was established in 2000 to eliminate the expired license backlog. In calendar year 2003, the Department completed 101 licensing actions that reduced the expired license backlog to 16 % of all licensed facilities. The current goal is to reduce the expired license backlog to no more that 5 % of all licensed dischargers by the end of calendar year 2004.

Emerging Issues: Since NPDES authorization in January of 2001, the water permits program has been involved in a number of emerging issues including development of a General Permit, site specific permits, a permit for eradication of invasive plants and a compliance program for finfish aquaculture facilities. The permit program expects that in the near future it will be involved in the following emerging issues: calcium enhancement of Downeast Rivers for Atlantic Salmon restoration, West Nile virus control, radio nuclides in drinking water plant effluent and increased inclusion of nutrient limits (N and P) in permits due to the development of ambient nutrient criteria.

Section 3-3 Nature & Extent of Nonpoint Sources of Pollutants, and Program Recommendations

The Maine NPS Water Pollution Control Program

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In 1991, the Maine Legislature enacted a Nonpoint Source (NPS) Water Pollution Management Program statute (38 M.R.S.A. §410-I) to help restore and protect water resources from NPS pollution. The basic objective of the NPS program is to promote the use of State Agency-defined "best management practice guidelines" (BMPs) in order to prevent water pollution.

The DEP administers the Maine NPS Program in coordination with other state, federal, and local governmental agencies as well as non-governmental stakeholder organizations. State agencies that share responsibility for coordinating and implementing NPS programs include: the Department of Agriculture; Department of Conservation, Maine Forest Service; Department of Transportation; Economic and

Community Development; Department of Human Services, Division of Health Engineering; Department of Marine Resources, and the State Planning Office.

In 1999, the DEP and the State Planning Office (SPO) coordinated development of a strategic plan for the NPS Program that was entitled: "Maine NPS Control Program: Program Upgrade and 15 Year Strategy."

The overall aims of the NPS Water Pollution Control Program are:

Clean Water

Prevent, control, or abate water pollution caused by nonpoint sources so that beneficial uses of water resources are maintained or restored and so those waters meet or exceed their classification standards.

Using Best Management Practices

Ensure that Best Management Practices are widely used in all of Maine's watersheds to minimize transport of pollutants or excessive runoff from surrounding land into surface or ground waters.

Locally Supported Watershed Stewardship

Local community awareness results in commitment to maintaining or improving the condition of local water resources through citizen action. Watershed stewardship meets community needs and maintains beneficial uses of local water resources.

Compliance with Applicable Laws

Confirm that regulated activities are in compliance with existing State and Federal laws and rules that relate to nonpoint source pollution abatement.

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Maine's lead NPS agencies have the responsibility to conduct programs that:

(1) implement a variety of enforceable authorities (State laws, rules and municipal ordinances, governing specific land use activities or locations that require people to comply with certain performance standards that protect water quality); and

(2) encourage the voluntary implementation and utilization of BMPs

These lead NPS agencies in State government have formal and informal working arrangements with other State and federal agencies, municipalities, non-governmental organizations, and business sector associations that address the abatement of nonpoint sources of water pollution.

DEP and other State and regional agencies deliver a wide array of NPS-related services. These services include; regulatory (permitting, compliance assistance and enforcement), technical assistance, financial assistance, NPS technology transfer, and NPS pollution awareness outreach all of which either promote or require usage of appropriate BMPs to prevent or minimize nonpoint sources of pollutants or water resource degradation.

Statewide regulatory programs that operate to implement laws controlling potential sources of NPS pollution, include: the Stormwater Management Law; the Site Location of Development Law; Subdivision Laws; Erosion and Sedimentation Control Law; the State Subsurface Wastewater Disposal Rules; the Natural Resources Protection Act;

Land Use Regulation in Unorganized Territories; Pesticide Control laws; the Mandatory Shoreland Zoning Law; The Nutrient Management Act, Forest Practices Act among others.

The State's lead NPS agencies also encourage voluntary actions by government, organizations, industry, and individuals that prevent or minimize the discharge of NPS pollutants. Program resources were assigned to support efforts both statewide and in specific watersheds that improve and protect waters that are either threatened by, or impaired due to, NPS pollution. These lead NPS agencies provide direct technical assistance and information about BMPs to agencies, municipalities, businesses, and individuals. The NPS Training and Resource Center at DEP provides information and technical training on usage of BMPs. DEP also administers an NPS Grants program to help fund NPS Pollution Control Projects that are designed to prevent, control or abate water pollution caused by nonpoint sources, so that water resources are maintained or restored. Grant funding for this program is derived from Section 319(h) of the Clean Water Act.

The Maine NPS Program has developed and will continue to develop Best Management Practice guidance manuals in order to provide information on practical methods to help protect Maine's streams, lakes, coastal waters and ground water. The following is a partial list of guidance manuals developed by the NPS Program.

"Strategy for Managing Nonpoint Source Pollution from Agricultural Sources and Best Management System Guidelines," Maine Dept of Agriculture, Food and Rural Resources, October, 1991.

"Phosphorus Control in Lake Watersheds: A Technical Guide to Evaluating New Development", MDEP, revised 1992.

"Maine Best Management Practices for Storm Water Quality and Quantity Control", MDEP, November, 1995.

"Best Management Practices for Erosion and Sediment Control", Maine Department of Transportation September, 1997.

"BMPs for Marinas and Boatyards: Controlling Nonpoint Pollution in Maine, an Environmental Guide for Marinas & Boatyards", MDEP/ SPO, March, 1999.

"Camp Road Maintenance Manual: A Guide for Landowners", MDEP and the Kennebec County Soil & Water District, 2nd edition, 2000.

"BMPs for the Handling of Wastes & Hazardous Materials at Construction Sites", MDEP November, 2001.

"Maine Erosion & Sediment Control Best Management Practices", MDEP, March, 2003.

"Best Management Practices for Forestry: Protecting Maine's Water Quality," Maine Forest Service, Maine Department of Conservation, 2004.

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Priority Waterbodies

Tables 3-3 through 3-5 presents lists of "priority waterbodies", as amended in 1998, for marine waters, rivers/streams and lakes (respectively) for which the Department will focus the Nonpoint Source Program (Source: Maine Nonpoint Source Management Plan). Priority waters are selected based on NPS impairment or threat status, value of the waters, and feasibility for success of restoration or protection efforts. The NPS Management Plan and the list of priority waters provide a basis for structuring 319 implementation projects and other NPS projects that help turn BMP planning and development ideas into effective on-the-ground pollution controls.

Table 3-3 Maine NPS Priority Waters List - Marine Waters

(17 total; listed geographically, west to east)

Piscataqua estuary	Royal River estuary	St. George River estuary
Spruce Creek	Cousins River estuary	Weskeag River
York River	Harraseeket River estuary	Rockland Harbor
Ogunquit River estuary	Maquoit Bay	Union River estuary
Webhannet River estuary	New Meadows River estuary	Machias River estuary
Scarboro River estuary	Medomak River estuary	

Note: The above list is duplicated in the Estuarine / Ocean Section (4.6) of this chapter, under the subsection title of: " Coastal Nonpoint Source Priority Watersheds". That section also includes a list of salmon river watersheds that are given a priority status under the Clean Water Act, Section 319-funded Nonpoint Source Program and the Shore Stewards Program.

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Table 3-4 Maine NPS Priority Waters List – Rivers and Streams

(55 total; listed alphabetically by waterway and county; boldfaced entries are highest priority)

Allagash River, Aroostook	**Fish Brook, Somerset**	**Piscataqua River, Cumberland**
Bond Brook, Kennebec	**Frost Gully Stream, Cumberland**	Pleasant River, Cumberland
Branch Brook, York*	**Great Works River, York**	**Pleasant River, Washington**
Capisic Brook, Cumberland	**Kenduskeag Stream, Penobscot**	**Presque Isle Stream. (includes North Brook), Aroostook***
Caribou Stream, Aroostook	Kennebunk River,York	**Prestile Stream, Aroostook**
Carrabassett River, Franklin	Limestone Stream, Aroostook*	**Presumpscot River, Cumberland**
Chandler Brook, Cumberland	Little Androscoggin River, Oxford	Royal River, Cumberland
Chapman Brook, Oxford*	Little Ossipee River, York	Salmon Brook, Aroostook
Cobboseecontee Stream, Kennebec	**Little Madawaska River, Aroostook***	Salmon Falls River, York*
Cold River, Oxford	**Long Creek, Cumberland**	**Sebasticook River, Somerset**
Collyer Brook, Cumberland	**Machias River,Washington**	**Sheepscot River (includes West Branch), Lincoln**
Crooked River, Oxford	Medomak River, Lincoln	Soudabscook Stream, Penobscot
Daigle Brook, Aroostook	**Meduxnekeag River, Aroostook**	St. George River, Knox
Denny's River, Washington	Mousam River, York	Stroudwater River, Cumberland
Dickey Brook, Aroostook	**Narraguagus River, Washington**	**Sunday River, Oxford**
Ducktrap River, Waldo	Nezinscot River, Oxford	Togus Stream, Kennebec
East Machias River, Washington	Nonesuch River, Cumberland	Union River, Hancock
East Branch Piscataqua River, Cumberland	Ossipee River, Cumberland	**Wesserunsett Stream, Somerset**
	Perley Brook, Aroostook	

* denotes community public drinking water supply

Table 3-5 Maine NPS Priority Waters List - Lakes

(181 total; listed alphabetically; boldfaced entries are highest priority;
town names are included only to identify general pond locations)

Adams Pond, Boothbay*	Estes Lake, Sanford	**Middle Range Pond, Poland**
Alamoosook Lake, Orland	Flying Pond, Vienna	Mirror Lake, Rockport*
Alford Lake, Hope	Folly Pond, Kittery*	Moose Hill Pd., Livermore Falls*
Allen Pond, Greene	Folly Pond, Vinalhaven*	Moose Pond, Sweden
Anasagunticook Lake, Canton*	Forest Lake, Windham	Mount Blue Pond, Avon*
Androscoggin Lake, Leeds	Fresh Pond, North Haven*	**Mousam Lake, Shapleigh**
Annabessacook Lake, Winthrop	Grassy Pond, Rockport*	**Nequasset Lake, Woolwich***
Bauneg Beg Pond, Sanford	Great Moose Lake, Hartland	Nokomis Pond, Newport*
Bay of Naples, Naples	Great Pond, Belgrade	No Name Pond, Lewiston
Beach Hill Pond, Otis	Green Lake, Ellsworth	North Pond, Norway
Bear Pond, Hartford	Haley Pond, Rangeley	North Pond, Smithfield
Bear Pond, Waterford	Halls Pond, Hebron*	North Pond, Sumner*
Beaver Pond, Bridgton	Hancock Pond, Embden*	North Pond, Warren
Berry Pond, Winthrop	Hancock Pond, Denmark	Norton Pond, Lincolnville
Big Indian Pond, St. Albans	Hermon Pond, Hermon	Notched Pond, Raymond
Big Wood Pond, Jackman*	Highland Lake, Windham	Otter Pond, Bridgton
Biscay Pond, Damariscotta	Highland Lake, Bridgton	Panther Pond, Raymond
Bonny Eagle Lake, Buxton	Hogan Pond, Oxford	Paradise Pond, Damariscotta
Boulter Pond, York*	Holland Pond, Limerick	Parker Pond, Casco
Branch Lake, Ellsworth*	Horne Pond, Limington	Parker Pond, Vienna
Branch Pond, China	Hosmer Pond, Camden	Parker Pond, Jay*
Brettuns Pond, Livermore	Ingalls Pond, Bridgton	Pattee Pond, Winslow
Buker Pond, Litchfield	Island Pond, Waterford	Peabody Pond, Sebago
Bunganut Pond, Lyman	Kennebunk Pond, Lyman	Pemaquid Pond, Waldoboro
Caribou, Egg, Long Pd, Lincoln	Keoka Lake, Waterford	**Pennesseewassee Lake,**
Carlton Pond, Winthrop*	Knickerbocker Pond, Boothbay	**Norway**
Center Pond, Lincoln	Lake Auburn, Auburn*	Phillips Lake, Dedham
Chases Pond, York*	Little Cobbosseecontee Lake	Pleasant Lake, Otisfield
Chickawaukie Pond, Rockport	Winthrop	**Pleasant Pond, Richmond**
China Lake, China*	Little Ossipee, Waterboro	Pleasant Pond, Turner
Clary Lake, Whitefield	Little Pennesseewassee, Norway	Pleasant Pond, T4 R3 WELS
Cobbosseecontee Lake,	Little Pond, Damariscotta*	Pocasset Lake, Wayne
Winthrop*	Little Sebago,Windham	**Pushaw Lake, Orono**
Cochnewagon Lake, Monmouth	Little Wilson Pond, Turner	Quimby Pond, Rangeley
Coffee Pond, Casco	Long Lake, Bridgton	Raymond Pond, Raymond
Cold Stream Pond, Enfield	Long Lake, T17 R4 WELS	Roberts Wadley Pond, Lyman
Coleman Pond, Lincolnville	Long Pond, Belgrade & Rome	Round Pond (Little), Lincoln
Crawford Pond, Warren	Long Pond, Bucksport	**Sabattus Pond, Sabattus**
Crescent Pond, Raymond	Long Pond, Southwest Harbor*	**Sabbathday L,New Gloucester**
Crooked Pond, Lincoln	Long Pond, Waterford	Saint Froid Lake, Eagle Lake*
Cross Lake, T17R5	Lovejoy Pond, Wayne	Saint George Lake, Liberty
Crystal Lake, Gray	Lower Narrows Pond, Winthrop	Salmon Lake, Belgrade
Damariscotta Lake, Jefferson*	**Lower Range Pond, Poland**	Salmon Pond, Dover-Foxcroft*
Dexter Pond, Winthrop	**Madawaska Lake, Westmanland**	Sand Pond, Monmouth
Dodge Pond, Rangeley	**Maranacook Lake, Winthrop**	Sand Pond, Denmark
Duckpuddle Pond, Waldoboro	Mattanawcook Pond, Lincoln	**Sebago Lake, Sebago***
Dyer Long Pond, Jefferson	McGrath Pond, Oakland	**Sebasticook Lake, Newport**
East Pond, Smithfield	Meduxnekeag Lake, Oakfield	Sennebec Pond, Union
Echo Lake, Presque Isle	**Megunticook Lake, Lincolnville**	Seven Tree Pond, Warren
Echo Lake, Readfield	**Messalonskee Lake, Sidney**	Shaker Pond, Alfred
Ellis Pond, Roxbury	Middle Pond, Kittery*	Silver Lake, Bucksport*

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Table 3-5 Maine NPS Priority Waters List - Lakes (continued)

South Pond, Warren	Togus Pond, Augusta	Watchic Pond, Standish
Spectacle Pond, Vassalboro	Torsey Pond, Mt. Vernon & Readfield	**Webber Pond, Vassalboro**
Square Pond, Acton	**Trickey Pond, Naples**	West Harbor Pond, Boothbay Harbor
Starbird Pond, Hartland*	Tripp Pond, Poland	Whitney Pond, Oxford
Swan Lake, Swanville	**Unity Pond, Unity**	Wilson Lake, Acton
Swan Pond, Lyman	**Upper Narrows Pd, Winthrop***	Wilson Pond, Wilton
Taylor Pond, Auburn	**Upper Range Pond, Poland**	Wilson Pond, Wayne
Thomas Pond, Casco	Varnum Pond, Wilton*	Wood Pond, Bridgton
Thompson Lake, Oxford	Ward Pond, Sidney	Woodbury Pond, Monmouth
Threecornered Pond, Augusta	Wassookeag Lake, Dexter*	Young Lake, Mars Hill*
Threemile Pond, Windsor		

* denotes a community public drinking water supply

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Watershed Management for Stormwater Programs

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Stormwater management has become a topic of increasing concern in Maine, both environmentally and politically. As progress has been made in cleaning up our State's waters from "end-of-pipe" wastewater discharges, the DEP is now finding that some of the most significant water quality problems are not from these discharges, but from the cumulative effect of a number of activities ranging from agriculture to development to household management. Pollutants from these activities include; toxins, bacteria, sediment and nutrients, and they are often conveyed to lakes, rivers, streams and coastal waters via stormwater runoff.

The Department has been working on stormwater management issues for many years. Much has been learned about the effectiveness of different stormwater treatment practices, known as Best Management Practices (BMPs), through both in-state and national studies. This field continues to expand and the Department continues to support research through its Nonpoint Source (NPS) Program, funded through Section 319 of the Federal Clean Water Act. The NPS Program has also allowed the Department to invest in the identification and elimination of pollution sources, as well as to conduct education and outreach activities.

The Department has also been managing stormwater through regulatory programs. Controlling erosion and sedimentation from land use activities as well as control of stormwater have all been provisions of the Site Location Law since the early 1970's. However, standards to treat the quality of stormwater, not just the quantity, did not exist until the passage of the Stormwater Management Law in 1996, and the subsequent rules were adopted in 1997.

The Stormwater Management Law requires the Department to "establish by rule a list of watersheds of bodies of water most at risk from new development." This law also obligates the Department to develop a list of sensitive or threatened regions or watersheds that include "the watersheds of surface waters that are susceptible to degradation of water quality or fisheries because of the cumulative effect of reasonably foreseeable levels of development activity within the watershed of the affected surface waters." The Department must also adopt rules specifying quantity and quality standards for stormwater to apply in those watersheds.

In 1997, the Department did develop lists of "most at risk" lakes, coastal waters and streams with public water supplies, and sensitive or threatened watersheds for lakes, and rivers with public water supplies. Quantity and quality standards were also established. However complete lists of "most at risk" and "sensitive or threatened" rivers and streams were not established due to lack of needed data to support which waters should be included on the lists. Although suitable data became available in 2002, the Department held off on rulemaking because of the desire from many interested parties to have the Department's proposal reviewed through a stakeholder process.

In addition to the State Stormwater Law, in 2003, new federal requirements went into effect under the Maine Pollutant Discharge Elimination System (MEPDES) stormwater program. The Department issued general permits to regulate construction activities disturbing one acre or more of land, and to regulate municipal separate storm sewer systems (MS4s) that are in 28 municipalities or in 10 "nested" state or federal MS4 entities.

The Department's experience administering the Stormwater Law, coupled with the added responsibility of administering the federal program requirements, has led Department staff to conclude that changes are needed to improve both the effectiveness and the efficiency of Maine's stormwater program. In the winter of 2004, following an extensive stakeholder process, the Department issued a report to the Maine Legislature, which included recommended changes to the Maine Stormwater Law in order to:

- align it better with the MEPDES program by using a 1 acre disturbance threshold;
- allow the Department to apply stormwater quality standards to all jurisdictional activities; and
- allow the Department to designate "significant existing sources" of stormwater pollution

The Department has developed draft rules which would replace existing quantity and quality standards with a new set of standards designed to provide both quantity and quality protection. Under the proposal, the new standards would apply to all watersheds, except where a more restrictive phosphorus standard would still apply in "most at risk" lake watersheds (the "most at risk" and "sensitive or threatened" designations would no longer be used outside of lake watersheds). Additional standards would also apply to projects in stream watersheds impaired due to urban runoff. To minimize confusion, these "impaired streams" do not appear as a separate listing or category; these stream watersheds are a subset of those streams on the 303(d) list where urban runoff has been identified as a principal source of pollution. Developers in these watersheds would be required to either pay a compensation fee or provide additional mitigation.

The Department is also encouraging municipalities to collectively address stormwater from existing sources through the development of watershed management plans. Where such plans are being implemented, the proposed additional regulatory requirements for new development in impaired watersheds would be reduced or even eliminated.

The Maine Legislature deferred action on the proposed statutory changes in 2004, but gave the DEP authority to proceed with rule making in 2004. The Department is

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required to report back to the Legislature on January 2nd, 2005 with provisionally adopted rules and recommended changes to the statute.

Land Use and Growth Management

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Related Websites: Site Law www.maine.gov/dep/blwq/docstand/sitelawpage.htm

NRPA www.maine.gov/dep/blwq/docstand/nrpapage.htm

Shoreland Zoning Act www.maine.gov/dep/blwq/docstand/szpage.htm

It has long been recognized that land use practices have direct impacts on water quality. The State of Maine has several programs in place to regulate land use activities that have potentially adverse environmental effects. The Site Location of Development Law (Site Law) requires developers of large projects to obtain permits from the Department of Environmental Protection before beginning construction. Under the Natural Resources Protection Act (NRPA), a permit from the DEP is required for any activity in, on or adjacent to a protected natural resource, including rivers, streams, brooks, great ponds, coastal wetlands, freshwater wetlands, sand dunes and fragile mountain areas.

The Mandatory Shoreland Zoning Act requires towns to control building sites, land uses, and placement of structures within their shoreland areas in order to protect water quality, habitat and fishing industries, and to conserve shore cover, public access, natural beauty and open space. Also important to environmental protection is the Growth Management Act, which was enacted in 1988. The foundations for this program are based on comprehensive planning and greater cooperation between state and local governments.

Section 3-4 Education and Outreach

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Related Website: www.maine.gov/dep/education/index.htm

Since much of the degradation to the environment comes from individual actions, public education is vital to the mission of the Maine DEP. The Department has a responsibility to educate the public about the environment, requirements of environmental laws, and how to protect Maine's natural resources. To accomplish these goals, the DEP must encourage behaviors and social norms that reduce human impact on water quality. In short, the Department must help to foster and encourage greater stewardship. This responsibility is shared among many different components of the Department; all with the common vision of conducting outreach that covers the many different types of water resources, particularly lakes, rivers, streams, wetlands, and groundwater.

Each year the DEP is engaged in many different outreach efforts. In order to be more effective, some program areas are adopting social marketing principles: including focusing on behavior change, gathering research data on target audiences and assessing the effectiveness of campaigns. In particular, social marketing strategies have been included in two of the minimum control measures for the Stormwater Phase II Program, in the LakeSmart Campaign, in the Invasive Prevention Program, and in the Soil Erosion Prevention Campaign. In addition, starting with the 2005 RFP cycle, grant proposals to be funded with CWA section 319 monies will be required to start applying basic social marketing principles to any proposed outreach efforts.

Finally, the Department is also focused on partnering with other agencies and organizations wherever possible to create synergy through combined efforts towards accomplishing a common goal. For example, the DEP is embarking on a statewide mass media Stormwater Awareness Campaign in concert with the 38 regulated MS4 (Municipal Separate Storm Sewer System) entities.

Section 3-5 The Environmental Impact and Economic & Social Costs/Benefits of Effective Water Quality Programs

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The environmental impact of effective water quality programs should be clear; that is, by definition, effective programs should have a positive impact on the quality of waters that they protect as well as on the larger ecosystem that contains those improved waters. However, assessment of the many types of costs and benefits associated with water quality changes is typically a very difficult task. Although often complex, calculating the direct economic cost of environmental regulation is largely possible by determining financial outlays and using those figures as a "cost-proxy." Quite the opposite is often true when the benefits of these water quality programs are studied. While it is usually possible to determine that an improvement has been gained and to show quantitatively the benefits, usually there is no easy way to directly correlate these improvements as positive impacts in terms of human health or the environment.

When the indirect economic and social costs/benefits of water quality protection, such as jobs lost or gained, positive or negative effects on competitiveness, worker productivity and satisfaction, etc., are considered and included in an analysis, the layers of complexity that they bring to the computations can be overwhelming. When they are addressed, these indirect costs and benefits of environmental improvements are often based on assumptions, subjective evaluations and qualitative data that are not easily distinguished (unequivocally) from other economic and social costs/benefits.

The different classes and categories of benefits (many of which provide vague results) of water quality protection are often difficult to compare with economic costs and are essentially impossible to compare with the extremely vague category of social costs. Figures in dollar values cannot be assigned to many of the benefits, so water quality and the environment would nearly always loose if the cost versus benefit comparison were limited to only economic aspects and the social aspects were ignored. In fact, such a superficial analysis of water quality protection efforts would undoubtedly have deterred much of the environmental progress Maine has made since the early 1970's. Consider this: tourism is an important component of Maine's economy; water quality undeniably is one component of Maine's attraction to tourists, but what part of Maine's economic increase has resulted from the efforts to protect and improve the state's waters? This is not a question that is answered easily.

Despite the fact that calculating benefits is a difficult task, waterbodies that were once heavily and visibly polluted are now supporting their designated uses of swimming, fishing, wildlife habitat, and recreation. One common example of a direct benefit that has been cited in the past, are the results from construction of wastewater treatment plants for industrial and municipal facilities. In this example, these benefits are not either economic or social; they are both. This inseparability of economic and social costs and benefits is probably true in most cases, although in some scenarios one type of benefit may be in the clear majority. In another example, more and more Maine towns are currently charging premium taxes for riverfront properties that, only 25 years ago, no one wanted. Again, this provides both economic benefits from an increased tax base along with the many social benefits associated with clean rivers that all who choose to use them for recreation may enjoy them.

Another stage in environmental management is emerging, wherever cleaning up the severe pollution (much from point sources) has been very successful. Now the focus is shifting to sources and contaminants that are not as easy to clearly identify and that were previously masked by the severe and large-scale problems. In many areas of environmental study, methods and tools have already been developed to deal with past issues - these methods provide a guide or framework in which to tackle emerging issues. For many of the reasons stated in the above paragraphs, the economic tools that would be so useful in helping to estimate the costs and benefits of improvement in water quality have never been fully developed. As future environmental problems grow in complexity (and in cost) and as public budgets tighten into the foreseeable future, justifying the expense or demonstrating the true benefit of water quality related programs are likely to be one of the main causes for delay of support for continued improvement of water resources. The time to begin developing basic economic tools for environmental projects has already passed; the time when more sophisticated economic methods will be an essential part of "doing business" is rapidly approaching.

Costs of the State Water Quality Program

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Due to changes in the format of the 2002 305(b) Report, many of the narrative sections were dropped from that reporting cycle – including program cost information. So, as was reported in the year 2000 305(b) report "In 2000, the cost to administer water-related programs [in the Department's Bureau of Land and Water Quality (DEP BLWQ)] was approximately 11.1 million dollars." For the 2004 reporting cycle, the Bureau will report on program costs for state fiscal years (which run from July 1st to June 30th) 2001 through 2003. The briefest possible summary of DEP BLWQ program administration costs is the following; in 2001 these costs were approximately 10.8 million dollars, in 2002; approximately 13.5 million dollars and in 2003; approximately 16.4 million dollars. The following subsections and graphs will describe program costs in further detail and will also include a few specific program area highlights. In Figure 3-1, the above annual figures from fiscal year 2001 to 2003 are broken down by the funding source (federal, state or dedicated).

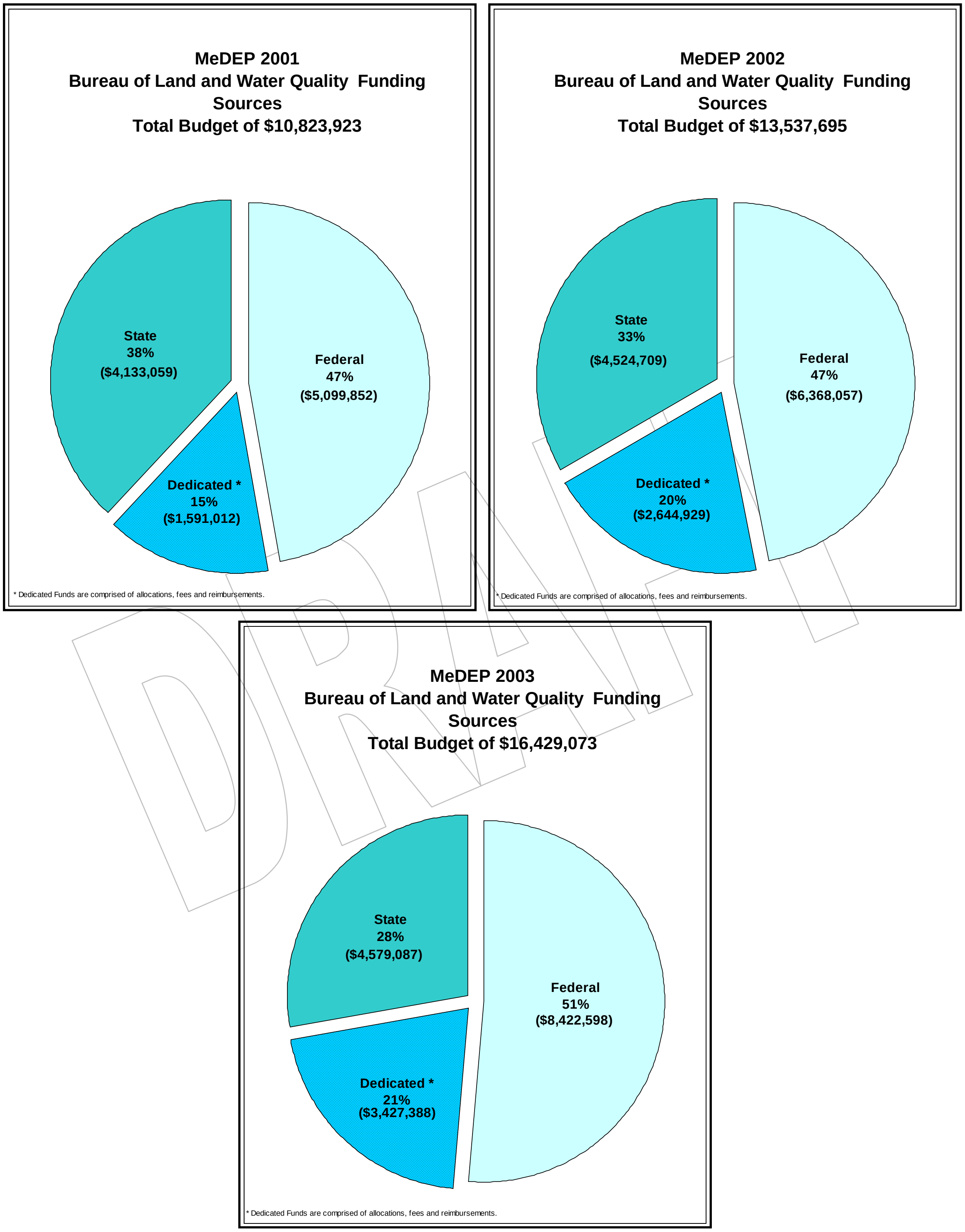
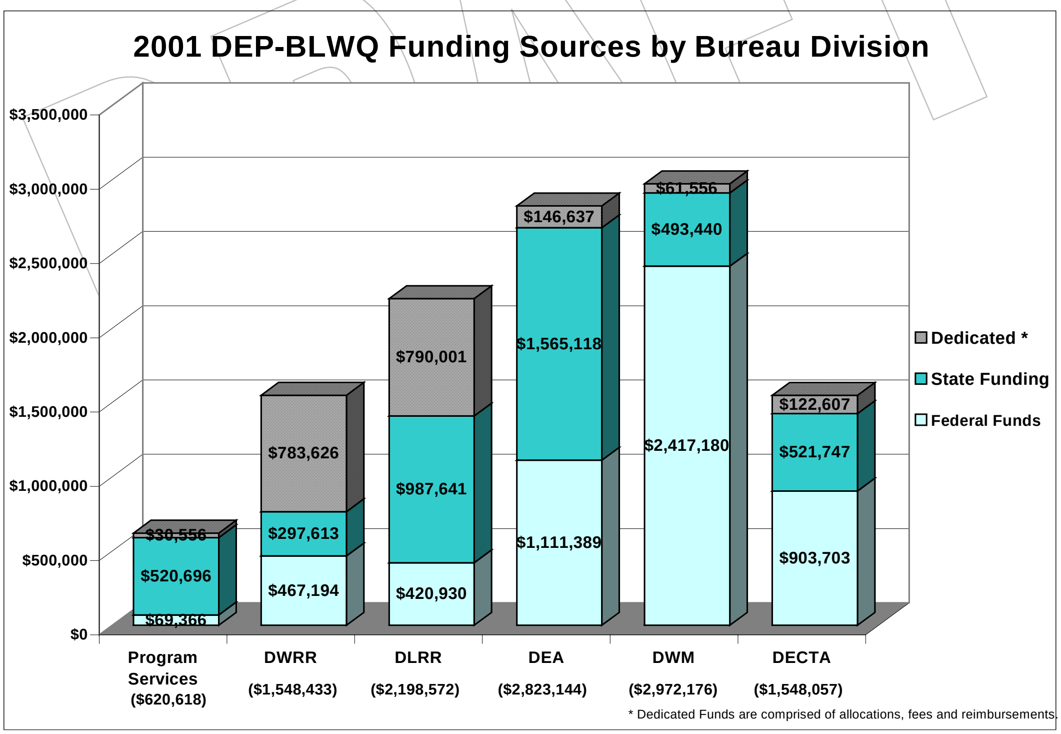
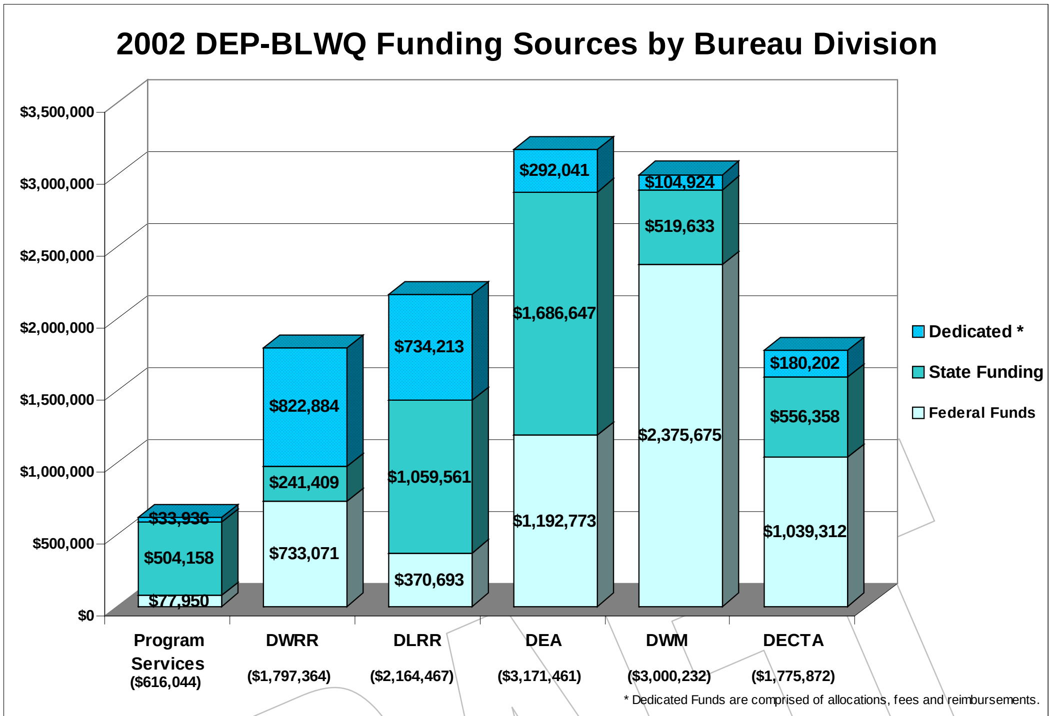


Figure 3-1 DEP BLWQ Total Funding and Sources for FY 2001 through FY 2003.

Functional program areas within the Bureau of Land and Water Quality include licensing, compliance, enforcement, technical assistance, pollution prevention, wastewater engineering, environmental assessment, lake restoration, nonpoint source control and groundwater protection. It should be noted that the total annual costs cited above do include positions that are focused primarily on land use regulation. However, team members in these positions are frequently involved with issues related to water quality and it could be argued that the majority of their land use activities will ultimately have a positive impact upon the quality of adjacent and downstream waters.

Organizationally, the DEP Bureau of Land and Water Quality is comprised of five divisions and one section devoted to program services that performs administrative functions for the various divisions. A web page that details how these entities are organized can be viewed at this URL: www.maine.gov/dep/blwq/organiza.htm. The divisions are as follows: Water Resource Regulation (DWRR), Land Resource Regulation (DLRR), Environmental Assessment (DEA), Watershed Management (DWM) and Engineering, Compliance & Technical Assistance (DECTA). Figure 3-2 depicts total annual funding by division for fiscal years 2001 through 2003 and also breaks down the total funding by source (federal, state or dedicated).





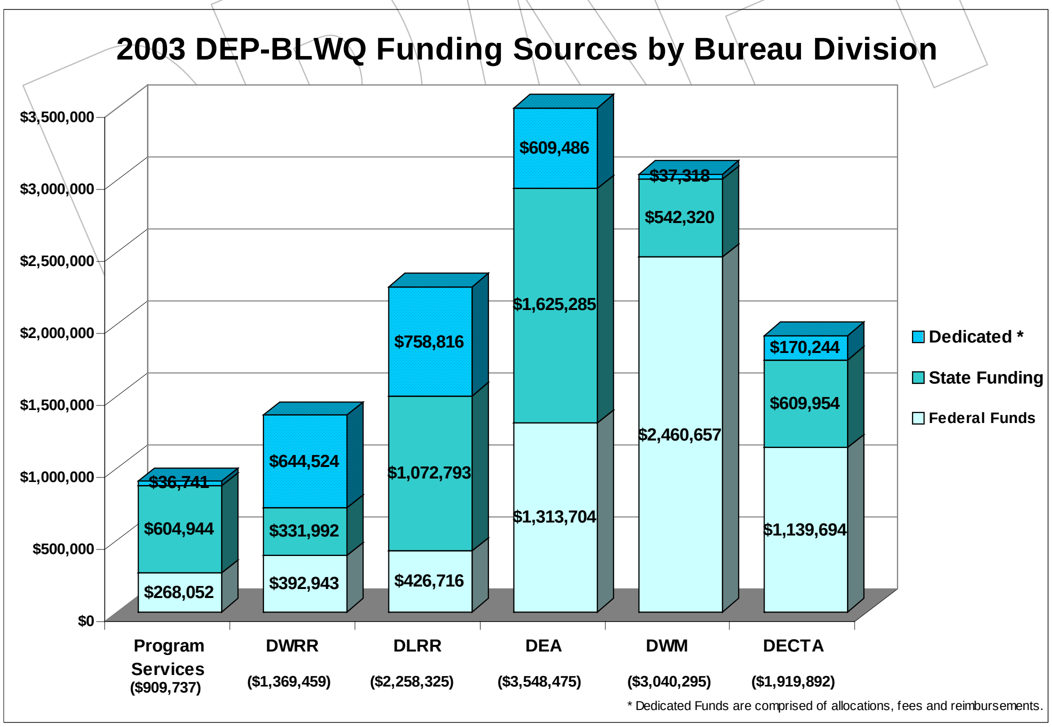


Figure 3-2 DEP BLWQ Division Funding and Sources for FY 2001 through FY 2003

The reader should be cautioned that the above figures do not provide enough detail to avoid misinterpreting the relative amounts of funding. For example, the DWM appears to receive almost double the amount of federal funding when compared to other divisions. However, the Section 319 - nonpoint source monies are the largest federal funding subcategory for this division, and it provided $2,165,571, $2,136,459 and $2,180,443 in FY 2001 through 2003, respectively. What is not explained on these graphs is the fact that, by law, at least 40 percent of these funds must be in the form of pass-through grants to other entities (such as groups conducting watershed surveys) and is not truly utilized within the Division of Watershed Management. This would bring the actual use of these funds inside the division down to a respective maximum of $1,299,342, $1,281,875 and $1,308,265 in FY 2001 through 2003, which is similar to the level of federal funding received by other divisions.

Another subject that is not adequately defined in the above graphs and discussion is the amount of funding that is directed towards completing Total Maximum Daily Load (TMDL) studies. Teasing out the actual amount of money spent on TMDLs each year is a bit more difficult because these studies span all of the fresh waterbody types and therefor utilize monies contained in multiple funding categories. The figures in Table 3-6 do not account for 100 percent of the costs of completing these studies and producing TMDL reports; they do include such expenditures as staff salaries and benefits, data collection and analysis, model creation, validation and various forms of contract support. So, these figures are a very close approximation of the real numbers and should provide at least a realistic sense of the level of resources that are committed to producing some of the fundamental information that is crucial to the 305(b) reporting process.

Table 3-6 Approximate TMDL Expenditures – Annual Totals and by Waterbody Type.

TMDL Expenditures				
Year	**Waterbody Type**			**Total**
	Lakes	**Rivers**	**Streams**	
2001	$202,243	$211,499	$91,140	$504,882
2002	$276,993	$216,499	$102,669	$596,161
2003	$255,243	$216,499	$117,440	$589,182

There are numerous other state programs within and outside of the DEP that control impacts to water quality (many of which are described in other sections of this report). Examples of some outside programs include; the Department of Human Service's Subsurface Waste Disposal Rules and Drinking Water Program, the Department of Agriculture's Pesticide Control Board and Manure Handling Compliance Program, the Department of Marine Resource's Shellfish Program and the Department of Conservation's Natural Areas Program, to name only a few. Currently there is no comprehensive system or effort in place to catalog all of the water quality-related State administrative costs. Beyond state-level agencies there exists a multitude of federal, county, local, volunteer and private organizations that all contribute funds towards the protection and improvement of the State's waters. Again, there is no known, recent endeavor to undertake a comprehensive listing of these organizations with the goal of estimating how many millions of dollars they spend annually to mitigate the effects of pollution in Maine's waters.

Wastewater Facility Construction

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Related Website: www.maine.gov/dep/blwq/grants.htm

In State Fiscal Years 2002 and 2003, the Maine DEP Construction Grants Program and the State Revolving Fund (SRF) funded 63 projects, some with assistance from the United States Department of Agriculture (USDA) Rural Development program grants/loans and Community Development Block Grant (CDBG) grant money. These projects included new facilities, upgrades, additions, modifications, abatement of combined sewer overflows and refinancing for a total cost of approximately $85,000,000 in State grants and SRF loans.

Small Community Grant Program

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Related Website: www.maine.gov/dep/blwq/grants.htm

From its inception in 1982, the Small Community Grant Program (SCGP) has disbursed 22 million dollars in grant monies. Although state bond issues usually fund this grant program, in the past it has also received some funding directly from state appropriations. These funds have been used to assist municipalities with the construction of individual or cluster-type wastewater treatment systems that were designed to eliminate heavily polluted discharges from either already malfunctioning systems or non-existing system ("straight pipes"). This amount of funding has resulted in the construction of new wastewater treatment facilities in over 300 communities throughout the state. Currently, the total estimated value of the facilities built with Small Community Grants is approximately 26 million dollars. Table 3-7 provides a summary of information about the program on a year-by-year basis.

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Table 3-7 Yearly Summary of SCGP Activities.

Small Community Grant Program: Year-by-Year Summary				
Year	**Grant Amount Disbursed**	**Total Facility Value**	**Systems Installed**	**Wastewater Treated (Gal/Day)***
1982	$334,738	$403,299	115	31,050
1983	$945,758	$1,139,467	255	68,850
1984	$718,764	$865,981	156	42,120
1985	$1,185,070	$1,427,795	256	69,120
1986	$729,090	$878,422	177	47,790
1987	$865,771	$1,043,098	151	40,770
1988	$754,444	$908,969	111	29,970
1989	$921,980	$1,110,819	172	46,440
1990	$993,969	$1,197,553	183	49,410
1991	$1,376,411	$1,658,327	250	67,500
1992	$920,000	$1,108,434	277	74,790
1993	$944,785	$1,138,295	196	52,920
1994	$1,608,903	$1,938,437	335	90,450
1995	$1,099,043	$1,324,148	247	66,690
1996	$894,036	$1,077,152	195	52,650
1997	$910,692	$1,097,219	209	56,430
1998	$1,145,088	$1,379,624	187	50,490
1999	$769,086	$926,610	122	32,940
2000	$1,370,528	$1,651,238	251	67,770
2001	$1,142,009	$1,375,914	167	45,090
2002	$1,354,130	$1,631,482	208	56,160
2003	$1,086,265	$1,308,753	183	49,410
Totals:	**$22,070,560**	**$26,591,036**	**4,403**	**1,188,810**

* These figures are based on calculations derived from the Maine Plumbing Code.

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Although very informative, the above table does not illustrate the fact that so many communities are interested in the SCGP, that their requests far outweigh available funding. For example, in 2002, 111 communities requested funds totaling approximately 2.3 million dollars and the entire 1.4 million dollars allocated for that year were awarded. Again in 2003, the 1.1 million dollars that were allocated for that year were completely expended to fund only a portion of the approximately 2.3 million dollars applied for by 131 towns. However, the success of this program is not measured by the fact that towns compete for more funds than are available. Success is measured by the fact that, from its inception, the Small Community Grants Program is estimated to have cumulatively eliminated the discharge of 1.2 million gallons of untreated wastewater every day.

Overboard Discharge Grant Program

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Related Website: www.maine.gov/dep/blwq/grants.htm

The Overboard Discharge Grant Program (ODGP) commenced in 1990. At first, the program sought to license all known overboard discharge systems (OBDs), then the focus shifted towards grant funding the eventual removal of many OBDs (where technically feasible). The reason for wanting to remove as many of these systems as possible is very simple. Even though these systems do treat wastewater; it is not possible to monitor them as closely as a large, traditional municipal or industrial treatment facility, so if an OBD treatment system malfunctions, the problem may not be caught quickly enough to prevent the system from contaminating nearby waters, beaches, clam flats, etc.

For any unfamiliar with the term, an overboard discharge is the discharge of wastewater from residential, commercial, and publicly owned facilities into streams, rivers, lakes and the ocean. A licensed OBD is one that is known, regulated and required to provide treatment of wastewater before it is discharged into a receiving water. Wastewater is treated by the system before it travels from homes, buildings and other facilities into a receiving waterbody. An illicit, or unlicensed, ODB may be a "straight pipe" where wastes and wastewater still travel directly from a building into a receiving waterbody without any treatment. (These are not common, but may still exist in a few locations and should be reported immediately upon discovery.) An OBD with a treatment system is typically installed in locations where "straight pipes" had historically existed, but where poor soils or small parcel sizes prevented the installation of a traditional septic system and where connections to public wastewater systems were simply not available. It should be noted that because OBD replacement systems are usually built on sites with very limited area for disposal fields, the construction costs could be much higher that systems built under good conditions. Despite the increased expense, the value recovered is still much higher than the costs, as is detailed in the next paragraph.

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To date, the Overboard Discharge Grant Program has been funded with 7 million dollars from bond issues. From 1991 through the end of 2002, 206 grants totaling 6 million dollars were made to both towns and individuals. Since the beginning of the program, approximately 4.9 million dollars have been spent in the process of removing 446 systems. A total of 78 OBD systems were removed in 2001-2002 and during this same period, 840 acres of shellfish habitat were re-opened to shellfish harvesting. As detailed in Table 3-8, the total acreage opened to shellfish harvesting since the start of the OBD Grant Program is over 16,000 acres. According to the Department of Marine Resources (DMR), opening and fully utilizing this much shellfish harvesting area has the potential to release a harvest with a retail value of over 40 million dollars.

Table 3-8 Shellfish Areas Opened from 1991 to 2003

Town	Name of Shellfish Area	1991- 1998	1999	2000	2001	2002	2003
		Acres Opened	Acres Opened	Acres Opened	Acres Opened	Acres Opened	Acres Opened
Addison	Cape Split Hrbr, Eastern Hrbr	82	53				
Bar Harbor	Indian Point	49					
Beals	Black Duck Cove, Flying Place	68	39				
Blue Hill	Bragdon Brook Cove			198			
Bremen	Greenland Cove			100			
Brooklin	Naskeag Point	10					
Brooksville	Seal Cove, Weir Cove, Orcutt Hrbr	1,468	81				
Cushing	Pleasant Point				189		
Deer Isle	Sylvester Cove, Dunham Point		241				
Eastport	Carrying Place Cove	400					
Freeport	Cousins River	87					
Friendship	Hatchet Cove		86				
Gouldsboro	Prospect Harbor		1,076				
Hancock	Jellison Cove, Hancock Point	749					
Harpswell	Quahog Bay		1,627				
Isle au Haut	Thorofare	240					
Kittery	Spruce Creek				478		
Milbridge	Pigeon Hill Bay, Back bay	9	434				
Mount Desert	Indian Pt., Mill Cove, Somes Sound	240	50	1,893			
Ogunquit	Oarweed Cove					120	
Owls Head	Otter Point	50					
Scarborough	Plummers Island			4			
Searsport	Stockton Springs		51				
Sedgwick	Billings Cove		9				
S. Thomaston	Waterman's Beach				59		
Steuben	Pigeon Hill Bay, Pinkham bay	174	170				
Sullivan	Sullivan River	167					
Swans Island	Round Island, Mackeral Cove	44	55				
Tremont	Moose Island	965					
Trenton	MDI Narrows		69				
Vinalhaven	Arey Cove, Seal Cove	7	1,171	2,278			
W. Bath & Phippsburg	Bringham's Cove (New Meadows)						1,020
Yarmouth	Cousins River	7					
York	York River			141			
Total Acreage Opened		**4,816**	**5,212**	**4,614**	**726**	**120**	**1,020**
Cumulative Totals		**4,816**	**10,028**	**14,642**	**15,368**	**15,488**	**16,508**

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Nonpoint Source Management

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Related Website: www.maine.gov/dep/blwq/docwatershed/npscontrol.htm

Table 3-9 summarizes costs for NPS programs involving Federal grants under section 319 of the Clean Water Act in addition to non-federal matching funds. This summary does not include other State agency funding of personnel or programs conducting NPS control activities, so the following table is a summary of Section 319(h) Clean Water Act Grant Awards to Maine DEP. These figures are from the Department's Nonpoint Source Program and reflect totals for Federal Fiscal Years (FFY) 2000 through 2003.

Table 3-9 Summary of DEP Non-Point Source Grant Totals

Grant Year (FFY)	Federal 319 Award	Base	Incremental	Non-Federal Match	Total
2000	$2,256,413	$1,110,205	$1,146,208	$1,404,276	$3,660,689
2001	$2,647,731	$1,487,139	$1,160,592	$1,765,154	$4,412,885
2002	$2,739,543	$1,489,950	$1,164,593	$1,826,362	$4,565,905
2003	$2,740,732	$1,572,554	$1,168,178	$1,827,155	$4,567,887

Pollution Prevention and Cost Benefit Information

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The Clean Water Act and subsequent guidance documents developed by EPA contain an enormous amount of information on how to construct an integrated report on surface water quality. As expected, these guidance documents also describe what information should be included in a standard 305(b) Report. An outline of the 2004 report format contained language very similar to this sample topic title (and the title of this very report section): 'Economic & Social Costs and Economic & Social Benefits of Effective Water Programs.' This title suggests that the EPA and Congress still desire to obtain information about the costs and benefits of water quality programs, particularly those programs where they provide at least partial funding. It is quite understandable that those who are providing monies for a purpose would like to have some means of learning how those funds are benefiting, in this case, improved water quality.

When the cost-benefit type of analysis (CBA) was introduced as a component of the 305(b) Report, it probably seemed like a logical and straightforward approach to measuring both the cost and benefits of many of the water quality-related programs. The EPA deserves credit for tenaciously pursuing and requesting information on the benefits of these programs, because it is unclear if they (in most cases) have ever received good, complete qualitative figures and if they have gotten reliable numbers on a regular basis (in all cases). A quick review and analysis of past 305(b) reports would likely find that most of these submissions did not adequately provide information on cost-benefit and related analyses.

Typically (as will be the case this year for Maine) the cost-benefit section of the report provides specific information on the costs of those programs that either affect, or that are affected by, water quality. These figures on costs are accompanied with very general, if any, information on benefits provided by these very same programs. The reason for this disparity is that while it is often fairly easy to provide information on costs as spending from agency budgets, it is usually very difficult to provide an accurate dollar amount figure for something as abstract as an improvement to the quality of a given water. As is commonly known, many environmental factors fall into those areas in the economic fabric of a society where the results of market forces provide "value" as an intangible, qualitative "notion" rather than as a quantitative "figure" that can be directly derived or measured from other data. This, along with other issues, such as defining a "social benefit," makes calculating either the quantitative or the qualitative benefits of environmental improvements into a very daunting series of tasks.

As a counterpoint to this section's introduction, it does not seem as though enough information in the form of useful methods and tools to calculate benefits has been provided to the states. Based on past reporting, it would appear as though the states are ill equipped to grapple with the problem of calculating or even accurately estimating even the basic benefits of their water quality programs. Consequently, this portion of the 305(b) report has been historically neglected and not well understood.

Finally, it appears that if components of the federal government are truly interested in obtaining better and more complete assessments of the environmental benefits being derived from their funds, then they need to lead in the development of methods and tools to estimate the benefits of cleaner waters. It seems likely that the EPA, as the nation's clearinghouse of environmental studies, reports and datasets, may already have much of the information that would be needed as a foundation to build on in order to get this effort underway. For example, the study done in Maine (and reported in a previous 305(b) report) on water clarity and property values may, in concert with studies from other states, provide a completely functional tool (or a piece of a future tool) if these disparate puzzle pieces could be assembled. Or, if complete, working tools and methods do already exist, then the states may need to be made more aware of them and then shown how to implement, utilize and incorporate them almost "seamlessly" into both their accounting practices and program areas for them to be successful and sustainable.

The next subsection will introduce a program at the Maine DEP that is probably one of the most focused in the Department on providing real-world estimates of the benefits derived from it projects. Then the text will describe the relative amount of success that this program has had in obtaining and providing that type of information.

The Pollution Prevention (P2) Program:

This program is one of the three major program areas that fall under the Department's Office of Innovation and Assistance (OIA). The two other main programs in the OIA are the Small Business Technical Assistance Program (SBTAP) and the Toxics and Hazardous Waste Reduction Program (THWRP). The following table summarizes the various ways that the Office tracks its level of service to customers and indicates that the OIA is an expanding program that is enjoying greater interaction both with businesses and with individual citizens.

Table 3-10 Office of Innovation and Assistance – Technical Assistance Efforts

Service Tracking Category	2001	2002
Hotline Calls / e-mail Inquiries	11489	17846
Staff Onsite Visits	445	513
Training Activity Participants	3820	N/A
Workshop Participants	N/A	830
Individual Pieces of Mail Sent	3680	4855
OIA Home Page Visits	N/T	14536
Teleconference (attendees)	124	6346
Permits Issued	212	237

N/A means "Not Available" and N/T means "Not Tracked"

It must be noted that the above figures are totals from all program areas that make up the OIA, and that since these programs often work in close concert with each other, it can be difficult to separate out the actual contribution made by an individual program. However, to the extent possible, the balance of this section will focus on the P2 Program as a separate entity.

The Pollution Prevention (P2) Program is based on the practical notion that it is far more protective of the environment (in addition to being far more cost-effective) to eliminate or reduce pollution at its source rather than to clean up pollution that has already been released into an ecosystem. The P2 Program engages in a proactive approach that utilizes the common ideals of increased efficiency, conservation of resources, reduced waste (and costs), etc. to identify those points in a process that generate pollution. Once identified, the P2 Program also utilizes many approaches like forming good habits, purchasing new products and implementing new technologies to analyze, zero in on and help to correct those portions of a process that generate preventable pollution. Then the Program uses some or all of these tools to reduce or eliminate that source of pollution.

The P2 Program has two distinct areas where it directs its outreach efforts and consequently, has two areas are where it conducts the majority of its business: these areas are "Household and Citizen Assistance" and "Business and Industry Assistance." Although significant resources and help is available for and utilized by households and citizens, due to the potential for sheer number of individual contacts, the P2 Program is really best able to attempt to track the potential economic impact of its efforts in the area of assisting business and industry. Documenting how the Program has helped other businesses in the past is a crucial part of building future relationships by being able to demonstrate how assistance from the program could benefit a business' budget in addition to it's compliance with environmental regulations. This means that gathering basic cost-benefit data is more likely to be considered a priority and to occur within the P2 Program when compared to other areas of the DEP.

Given these circumstances, along with repeated exposure to how much value is thought to be placed upon the bottom line by private business, one might expect to find a high incidence of figures indicating benefits of past projects. Analyzing only the

P2 Program's forty-three published case studies from 2000 (11 entries), 2001 (18 entries) and 2002 (14 entries) shows the following statistics:

- In 32 of the 43 case studies (74%), project expenses were not estimated or not reported by the business.
- Of the 11 remaining cases, 9 did report real dollar amounts, while the other two either reported a cost per unit or an estimated cost of "several million dollars."
- In 29 of the 43 case studies (67%), benefits of the project were not estimated (or not reported to P2 Program staff).
- Of the 14 remaining cases, only one failed to estimate a fairly concrete figure for the project's benefit, but it did provide a reason – variations in annual business cycles would affect the total value of savings.
- As far as non-monetary benefits are concerned, only 8 of the 43 case studies (19%) failed to either estimate or describe benefits in quantifiable terms of either a % reduction or a reduction in amount / time (e.g. lbs/year) of a pollutant, waste stream, etc.
- Finally, there were only 3 studies (7%) where the benefits were described in purely qualitative terms.

(see Table 3-11 for a complete list of summary information on the case studies used to generate these figures)

The above figures seem to support the idea that even under the best of circumstances (i.e. government agency and private business working cooperatively together); water quality programs are not likely (or sometimes able) to collect information on the benefits that they are providing to society. Once we consider other factors, for example, the occasionally contentious relationships that exist between agency and business, the chances for successfully engaging all parties and exchanging information on true costs and benefits of improving waters are reduced significantly. As far as the private sector influence is concerned on the above statistics, even the same business with different projects in different years produced variations – a business might calculate a cost and not the benefits with the opposite categories being calculated on another project. No one factor seemed to be driving consistency in reporting results.

Clearly moving the process of estimating cost and benefits from a single program up in scale to an agency, department or an entire state with multiple departmental involvement, non-government organizations, volunteer groups, non-profits, etc. would add layers of complexity to any proposed method of calculation. The question to answer is a seemingly very basic one "what benefits are all of these organization's activities adding to improving the environment?" The question that must be addressed first is "what tools can these organizations use to figure out and estimate the environment benefits that their activities create?" Both questions are important – neither has an easy answer.

For more information on the Maine Department of Environmental Protection P2 Program:

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Related Website: www.maine.gov/dep/oia/p2/index.htm

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Table 3-11 Summary Information on P2 Program Case Studies

Year	Name	Estimated Expense ($)	Estimated Benefit ($)	Estimated Resource Savings
2000	Bangor Water District	N/E	N/E	N/E
2000	Bath Iron Works	$9,789	N/E	11,590 lbs/year of photographic waste eliminated
2000	Cattail Press	$0	N/E	N/E
2000	Friends of Casco Bay	N/E	+/- $100,000	8,600 gal/year raw sewage diverted from the bay
2000	Goodkind Pen Co	N/E	Variable - $1,000's / year	18% of packaging reused or recycled
2000	Hawk Ridge Composting	$4,500,000	N/E	N/E
2000	International Paper	over $20,000	N/E	43.2 tons/year reduction in emissions
2000	Maine Dry Cleaners	N/E	$10,000 / year	Reductions of 2,113 lbs/year (waste) and 600 gal/year (solvent)
2000	Mount Desrt Island Water Quality Coalition	N/E	N/E	Reopening of clam flats, conservation of shellfish beds and the removal of a fecal-coliform source
2000	OSRAM-Sylvania	$42,850	N/E	Elimination of both hazardous cleaning chemicals and of air emissions
2000	Town of Portage	$33,000	N/E	25-77% reduction in phosphorus entering lake and a reduction of e-coli contamination at the source
2001	Auburn Educational Services	N/E	N/E	N/E
2001	Bio-Hazard Materials Working Group	N/E	N/E	Elimination of hospital-distributed mercury thermometers and a reduction in hospital waste streams
2001	Goodkind Pen Co	N/E	N/E	Multi-faceted project to acquire additional manufacturing space in the most environmental firiendly way possible
2001	Guilford of Maine	N/E	N/E	Reduced total energy consumption by 10% and reduce antimony released in wastewater by 25%
2001	International Paper – Bucksport	$103,000,000	N/E	Reduced steam generation emissions by 50% (2,500 tons/year), reduced ash emssions by 45% (6,750 tons/year) and reduced SARA 313 steam generation emsssions by 50% (132 tons/year) - now generates 120 - 175 mW of electricity with out increasing air emmissions
2001	Maine Environmental Policy Institute	N/E	N/E	N/E
2001	OSRAM-Sylvania	N/E	$9,375 / year	Reduced the generation of waste isopropyl alcohol by 50%
2001	Portland water District	32,515	N/E	Internal/external mercury awareness/reduction campaign and sponsored a mercury collection day
2001	Z-F Lemforder	$1,580	N/E	Resold 28 tons of plastic material and recyled 3 tons of plastic bags instead of landfilling, now conserves propane at the rate of 25 gal/day
2001	Dead River Company	$0.60 / thermostat	N/E	Eliminated the sale and installation of 500 mercury thermostats per year
2001	Lincoln Pulp & Paper	Several million dollars	bleaching costs reduced, but N/E	Development of the "*envirO$_2$*™" bleaching process - elimination of detectable dioxin, phenolics, and furan from bleach plant efluent and of elemental chlorine from production process, 50% reduction in chlorform emission and a 15% reduction in the aggregate amount of toxic chemicals used to manufacture pulp

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2001	Great Northern Paper	N/E	N/E	Significantly reduced its emissions of dioxins, chlorine and chlorine compounds with the elimination of these compound emissions from virgin fiber paper production
2001	Hussey Seating Company	N/E	N/E	VOC emissions were reduced by over 7 tons/year and hazardous waste disposal decreased by 2 tons/year
2001	International Paper	N/E	$600,000 / year	Reduction of SO_2 emissions by 174.31 tons/year without an increase in hard metal emissions
2001	Mead Paper	N/E	> $3,000,000 / year	Reduction in TSS by 56% and in fiber losses (to sewers) by 45% since 1989
2001	Dept of the Navy	N/E	$838,000 + $100,000 (future)	Reduction in boiler fuel consumption by 25.8% (470,000 gal), an estimated 1.1 million kWh/year (4.6%) reduction in electricity usage and water usage was reduced by an estimated 1 million gal/year - a 1.75% reduction and a total reduction in CO_2 emmission of 10,365.2 tons/year
2001	Town of St. Agatha	N/E	N/E	N/E
2001	USPS	N/E	$98,246	Increased the recycling rate of discarded mail to 84% and implemented a full scale mercury recycling program
2002	Bath Iron Works	N/E	$18,700 / year	Reduced the average amount of hazardous waste generated by 6,830 lbs/year
2002	Bath Iron Works	N/E	$32,300 / year	Reduced the average amount of hazardous waste generated by 28,560 lbs/year
2002	Colby College	N/E	N/E	33% reduction in hazardous substance use in laboratories, new central plant saves roughly 100,000 gal/year of fuel oil while generating about 2,000,000 kWh of electricity, campus-wide water consumption decreased by 23% and 95% of the paper used is chlorine free with a 60% post consumer recycled fiber content
2002	Georgia Pacific	N/E	$111,000 / year	Reduced water use by 1,120,000 gal/day and reduced wastewater generation by 55% which saves 400,000 gal/year of #6 fuel oil
2002	Town of Hamden	N/E	N/E	N/E
2002	National Semiconductor	N/E	N/E	Reduced sulfuric acid use by 880 gal/year
2002	National Semiconductor	N/E	$130,000	Reduced the amount of NF_3 used by 1,038 lbs/year
2002	National Semiconductor	N/E	$16,000 / year	Reduced the use of phosphoric acid by 912 gal/year and sodium hydroxide by 729 gal/year
2002	National Semiconductor	N/E	$216,000 / year	Chemical savings equates to a reduction of 14,400 gal/year
2002	NorDx	N/E	N/E	Reduction of mercury in wastewater and a reduction of mercury containing products used onsite
2002	Portland Water District	N/E	N/E	N/E
2002	Pratt & Whitney	N/E	N/E	Reduced generation of hazardous wastes by 15% (27,372 lbs) including coolants, nitric acid, grinding swarf, alkali, and miscellaneous wastes, also eliminated the use of cadmium
2002	Sappi	N/E	N/E	Phosphorus discharges have been reduced by 66% from 1999 levels without adversely affecting BOD (biochemical oxygen demand) or removal efficiencies and the annual chemical costs for nutrients have been reduced by 59%
2002	International Paper – Jay	N/E	N/E	Reduced the amount of solid waste to be landfilled by 140 cubic yards/day

N/E means "Not Estimated"

Chapter 4 SURFACE WATER MONITORING & ASSESSMENTS

Section 4-1 ASSESSMENT METHODOLOGY

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Listing Methodology for the 2004 305b/303d Integrated List

Determination of attainment is based on a water meeting all standards and criteria established for a water's classification (38 MRSA Section 465, 465-A, 465-B). Waters are listed by Assessment Unit (HUC) and/or waterbody segment in one of five categories of attainment (see description below). The listing does not consider fish consumption advisories due to mercury (Note: All freshwaters are listed by narrative in Category 4-B-3 as well as in one other category. See explanation in Category 4-B-3.), or for lobster tomalley (Note: All marine waters are listed by narrative in Category 5-D as well as in one other category. See explanation in Category 5-D). Each listing provides the Assessment Unit, Waterbody Number, Name, Size, Classification, Monitored Date*, and depending on assessment determination, information on impairment, notes on previous listings, or other information. Listings for all surface waters are found in the Appendices.

* The "Monitored Date" shown in the assessment tables (Appendices) indicates the year of the most recent data acquisition. The term "Evaluated" is used when the data used to make the assessment is greater than five years old or where qualitative information is used.

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Listing Categories (1-5)

Category 1:

Attaining all designated uses and water quality standards, and no use is threatened.

Highest level of attainment, waters in the assessment unit attain all applicable standards. Assessment is based on combined evaluation of the following information.

1. Current data (collected within five years) indicates attainment, with no trend toward expected non-attainment within the listing period.

2. Old data (greater than five years) indicates attainment and no change in any associated conditions.

3. Water quality models predict attainment under current loading, with no projected change in loading that would predict non-attainment.

4. Qualitative data or information from professional sources indicating attainment of standards and showing no identifiable sources (e.g. detectable points of entry of either licensed or unlicensed wastes) of pollution, low impact land use (e.g. intact riparian buffers, >90% forested watershed, little impervious surface), watershed within state or federal reserve land, park, wilderness area or similar conservation protection, essentially unaltered habitat, and absence of other potential stressors.

5. Determination that the direct drainage area has a human population of <0.1 per square mile according to U.S. Census data obtained in 2000 and watershed conditions as described in item 4, above. For lakes, determinations are based on

census data at the town level and consider all towns in the direct drainage of larger (referred to in previous 305(b) reports as “significant”) lakes. Populations for the remaining lakes (generally less than ten acres) are determined for the town listed as the point-of-record for the water according to the Department of Inland Fisheries and Wildlife Lake Index database.

Category 2:

Attains some of the designated uses; no use is threatened; and insufficient data or no data and information is available to determine if the remaining uses are attained or threatened (with presumption that all uses are attained).

Assessment is based on combined evaluation of the following information.

1. Current data (collected within five years) for some standards indicating attainment, with no trend toward expected non-attainment within the listing period, or an inadequate density of data to evaluate a trend.

2. Old data (greater than five years) for some standards indicating attainment, and no change in associated conditions.

3. Water quality models that predict attainment under current loading for some standards, with no projected change in loading that would predict non-attainment.

4. (For lakes) Probabilistic-based monitoring that indicates a high expectation of use attainment for certain classes of waters based on random monitoring of that class of waters.

5. Insufficient data for some standards, but qualitative data/information from professional sources indicate a low likelihood of impairment from any potential sources (e.g. high dilution, intermittent/seasonal effects, low intensity land use).

Category 3:

Insufficient data and information to determine if designated uses are attained (with presumption that one or more uses may be impaired).

Assessment is based on combined evaluation of the following information. Monitoring schedules are assigned to these waters.

1. Insufficient or conflicting data that does not confirm either attainment or non-attainment of designated uses.

2. Qualitative data or information from professional sources showing the potential presence of stressors that may cause impairment of one or more uses, however, no quantitative water quality information confirms the presence of impairment-causing stressors.

3. Old data, with:

    a. low reliability, no repeat measurements (e.g. one-time synoptic data),

    b. a change of conditions without subsequent re-measurement; or

    c. no evidence of human causes or sources of pollution to account for observed water quality condition (natural conditions that do not attain water quality standards are allowed by 38 M.R.S.A. Section 464.4.C).

4. (For lakes) Current data indicates a return to (or a trend towards) attainment standards over the past few years but requires confirmation; or conversely, that

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trophic or dissolved oxygen profile evaluation suggests deteriorating conditions requiring further study and verification. (Since lakes respond over a longer period of time and can be highly influenced by weather attributes, it is appropriate to recommend additional monitoring before attainment is determined.)

Category 4:

Impaired or threatened for one or more designated uses, but does not require development of a TMDL.

A water body is listed in category 4 when impairment is not caused by a pollutant; or, if impairment is caused by a pollutant, where a TMDL has already been completed or other enforceable controls are in place. An impaired waterbody will be listed in category 5 if both a pollutant and a non-pollutant are involved that would independently cause an impaired or threatened condition. Waters are listed in one of the following Category 4 sub-lists when:

1. Current or old data for a standard indicates either impaired use, or a trend toward expected non-attainment within the listing period, but also where enforceable management changes are expected to correct the condition,

2. Water quality models that predicted impaired use under loading for some standard, also predict attainment when required controls are in place, or,

3. Quantitative or qualitative data/information from professional sources indicate that the cause of impaired use is not from a pollutant(s) (e.g. habitat modification).

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4-A: TMDL is completed. A TMDL is complete but insufficient new data to determine that attainment has been achieved.

4-B: Other pollution control requirements are reasonably expected to result in attainment of standards in the near future.

4-B-1: Waterbodies impaired but with enforceable controls. Waterbodies where enforceable controls have a reasonable expectation of attaining standards, but where no new data are available to determine that attainment has been achieved. (Enforceable controls mayinclude: new wastewater discharge licenses issued without preparation of a TMDL, other regulatory orders, contracts for nonpoint source implementation projects, regulatory orders or contracts for hazardous waste remediation projects).

4-B-2: (new sub-category, previously 5-B-2 in 2002 report) Waterbodies impaired only by Combined Sewer Overflows Waterbodies impaired only by Combined Sewer Overflows where current CSO Master Plans (Long-Term Control Plan) are in place and that include; assurances that water quality standards will be attained, provisions for funding, and compliance timetables. Listing in 4-B-2 is provisional on Maine DEP's submission of a "compliance list" with major milestones, final estimated deadline for meeting water quality standards for each facility, and assurance of public notice of changes to any final compliance deadlines.

4-B-3: (new sub-category, previously 5-C in 2002 report) Impairment caused by atmospheric deposition of mercury (all Maine freshwaters are listed as 4-B-3 and are also listed under one of the other categories), and a regional scale TMDL is required. Maine has a fish consumption advisory for fish taken from all freshwaters due to mercury. Many waters, and many fish from any given water, do not exceed the action level for mercury. However, because it is impossible for someone consuming a fish to know whether the mercury level exceeds the action level, the Maine Department of Human Services decided to establish a statewide advisory for all freshwater fish that recommends limits on consumption. Maine has already instituted statewide programs for removal and reduction of mercury sources. The State of Maine is participating in the development of regional scale TMDLs for the control of mercury.

4-C: Impairment is not caused by a pollutant. Waters impaired by habitat modification. Waters that show impairment due to natural phenomena are listed in Categories 1-3 (natural conditions that do not attain water quality standards and criteria are allowed by 38 M.R.S.A. Section 464.4.C).

Category 5:

Waters impaired or threatened for one or more designated uses by a pollutant(s), and a TMDL is required.

Waters are listed in one of the Category 5 sub-lists when:

1. Current data (collected within five years) for a standard either indicates impaired use, or a trend toward expected impairment within the listing period, and where quantitative or qualitative data/information from professional sources indicates that the cause of impaired use is from a pollutant(s),

2. Water quality models predict impaired use under current loading for a standard, and where quantitative or qualitative data/information from professional sources indicates that the cause of impaired use is from a pollutant(s), or,

3. Those waters have been previously listed on the State's 303(d) list of impaired waters, based on current or old data that indicated the involvement of a pollutant(s), and where there has been no change in management or conditions that would indicate attainment of use.

5-A: <u>Impairment caused by pollutants (other than those listed in 5-B thru 5-D). A TMDL is required and will be conducted by the State of Maine</u>. A projected schedule for TMDL completion is included.

5-B: <u>Impairment is caused solely by bacteria contamination. A TMDL is required.</u> Certain waters impaired only by bacteria contamination may be high priority resources, such as shellfish areas, but a low priority for TMDL development if other actions are already in progress that will correct the problem in advance of TMDL development (e.g. better compliance). Certain small streams that are impaired solely by bacteria contamination but where recreation (swimming) is impractical because of their small size are listed in 5-B. A projected schedule of TMDL completion is included where applicable. Sub-category 5-B-2 used in the 2002 report has been replaced by 4-B-2.

5-C: (Sub-category removed, replaced by 4-B-3)

5-D: <u>Impairment caused by a "legacy" pollutant.</u> This sub-category includes:

1. waters impaired only by PCBs, DDT or other substances already banned from production or use. It includes waters impaired by contaminated sediments where

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there is no additional extrinsic load occurring. This is a low priority for TMDL development since there is no controllable load.

2. coastal waters that have a consumption advisory for the tomalley (hepato-pancreas organ) of lobsters due to the presence of persistent bioaccumulating toxics found in that organ. This is a low priority for TMDL development since there is no identifiable and controllable load.

Delisting from an Impaired to an Unimpaired Category.

Because there are a number of listing options available in the integrated list, some waterbodies may be removed from the previous 303(d) list, however, only under certain circumstances. The State must provide new information, to EPA's satisfaction, as a basis for not listing a specific water that had been previously included on a 303(d) list. Acceptable reasons for not listing a previously listed water as provided in 40 CFR 130.7(b) may include situations where:

- The assessment and interpretation of more recent or more accurate data demonstrates that the applicable water quality standard(s) is being met (list in Category 1, 2, (3 for lakes).
- The results of more refined water quality modeling demonstrates that the applicable water quality standard(s) is being met (list in Category 1 or 2).
- It can be demonstrated that errors or insufficiencies in the original data and information led to the water being incorrectly listed (list in Category 3).
- It can be documented that there are changes in the conditions or criteria that originally caused the water to be impaired and therefore originally led to the listing. For example, new control equipment has been installed, a discharge has been eliminated, or new criteria adopted (list in Category 1, 2, 3, or 4-B).
- The State has demonstrated pursuant to 40 CFR 130.7(b)(1)(ii), that there are effluent limitations required by State or local authority, which are more stringent than technology-based effluent limitations, required by the Clean Water Act, and that these more stringent effluent limitations will result in the attainment of water quality standards for the pollutant causing the impairment within a reasonable time (list in Category 4-B);
- The State has demonstrated pursuant to 40 CFR 130.7(b)(1)(iii), that there are other pollution control requirements required by State, local, or federal authority that will result in attainment of water quality standards for a specific pollutant(s) within a reasonable time (list in Category 4-B).
- The State included on a previous Section 303(d) list some Water Quality Limited Segments beyond those that are required by EPA regulations, e.g., waters where there is no pollutant associated with the impairment (list in Category 4-C).
- A TMDL has been approved or established by EPA since the last 303(d) list (list in Category 4-A).

Relisting ("off-ramping") Impaired Water Categories.

Maine proposes to relist certain Category 5 sub-lists to Category 4. These include sub-category 5-B-2 (CSO impaired waters) and sub-category 5-C (waters with fish consumption advisories due to mercury) from the 2002 Integrated Water Quality Monitoring and Assessment Report. The purpose of this relisting is to identify waters already under controls that do not require listing in Category 5 for the purpose of TMDL development. For the CSO-affected waters, these facilities have licenses and orders that will bring these waters into eventual attainment. For the mercury-affected

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waters, these controls include an array of state actions to reduce and remove local, in-state mercury sources. A regional or national TMDL that can be applied to out-of state mercury sources is probably required to bring these waters into eventual attainment.

Justification for Maine CSO off-ramping to Sub-category 4-B-2:

- No data are available which indicate other significant sources are contributing to non-attainment, and
- A CSO permit or administrative order (enforceable control) has been issued requiring compliance with water quality standards, and
- A master plan or abatement strategy is in place and being implemented, and
- The abatement strategy has a schedule to be fully implemented within a reasonable timeframe.

Impairment, Control, and Other Significant Sources{ TC \l1 "}

In order to delist a waterbody from the 303(d) list, it is important to consider why the waterbody was listed in the first place. CSOs in Maine were originally listed because of concern about gross pollution such as "floatables" and bacteria levels 100 times the level found in stormwater discharges. CSO abatement eliminates this gross pollution. Pollution control requirements in Maine are reasonably expected to result in attainment of water quality standards in the near future. There are no data that indicate other significant sources are contributing to non-attainment.

Enforceable Controls and Reasonable Time Frame

Maine's CSO strategy for urban areas is consistent with EPA's CSO policy. Most systems will be separated. For those that will have remaining overflow, Maine's Act to Create Wet-weather Water Quality Standards allows a temporary adjustment of water quality standards in waterbodies impacted by CSOs and maintains "the goal of the State to fully maintain and restore water quality and eliminate or control combined sewer overflows as soon as practicable". [Sec 1. 38 MRSA 464, sub-2-B]

All Maine's CSOs listed in sub-category 4-B-2 are required by permit to meet water quality standards. Nine waterbodies are scheduled for near-term attainment (within the next 5 years); fourteen are scheduled for mid-term attainment (within the next 10 years). Given overall steady progress made to date by the DEP in working with communities to address CSOs, and considering the high costs involved in the CSO abatement projects, the time frame presented by the DEP is reasonable. EPA has the authority to enforce the DEP's CSO schedules as well as to overfile in situations when EPA believes that the CSO abatement is not progressing at a sufficient pace.**{** TC \l1 "**}**

Justification for Maine Mercury off-ramping to Sub-category 4-B-3.

Most New England States including Maine currently have statewide fish consumption advisories resulting from high levels of mercury in fish tissue. To address this issue a phased alternative management approach has been developed with the intent to dramatically reduce and possibly eliminate mercury sources in the Northeast. This off-ramping approach is intended to address freshwaters where atmospheric mercury deposition is the only known pollutant source, but it may result in beneficial reductions to other water resources as well.

Mercury is persistent in the environment and cannot be destroyed; therefore managing the contamination is critically important. Mercury is naturally occurring, however, it can also be found in many waste stream products (such as thermometers and

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electrical switches), it is used in certain industrial processes, and it is emitted from combustion facilities. Mercury was also a component in paints, pesticides and other products; however, most of those uses have been discontinued. Mercury is bioaccumulative, thus the reason it is found in fish tissue. The primary public health concern with mercury is consumption of fish with elevated levels, particularly consumption of contaminated fish by pregnant woman and children.

Maine has been aware of a mercury contamination problem since the 1970s (Akielaszek and Haines, 1981; National Bioaccumulation Study, EPA 1986; International Toxics Monitoring Program 1992; Regional Environmental Monitoring and Assessment Program (REMAP), DEP, 1995; Surface Water Ambient Toxics Program, DEP 1994-2003). The REMAP study, a probabilistic study of Maine lakes, provided conclusive assessment of the widespread character of mercury contamination and implication that the most significant contamination load originated outside of the state. The first statewide fish consumption advisory for mercury was issued following the publication of the findings in that study.

Implementation of a Regional Mercury Strategy:

The Northeast states and Canada have been leaders in actions to reduce mercury pollution. In light of preliminary findings of the *Northeast States and Eastern Canadian Provinces Mercury Study (*Northeast States for Coordinated Air Use Management, Northeast Waste Management Officials Association, New England Interstate Water Pollution Control Commission and Canadian Ecological Monitoring and Assessment Network, 1998), which identified serious mercury impacts to the region and a number of controllable sources, the leadership of the New England States and Eastern Canadian Provincial environmental agencies established a workgroup to develop a coordinated plan to address mercury in the region. This workgroup developed the *New England Governors and Eastern Canadian Premiers Mercury Action Plan* (NEG-ECP MAP), which was unanimously adopted by the region's Governors and Premiers in June, 1998, at the 23rd annual meeting of the Conference of New England Governors and Eastern Canadian Premiers. A copy of this plan may be viewed here: www.state.ma.us/dep/ors/files/negecp.pdf

The NEG-ECP MAP is notable on several points. First, it is the first bi-national plan addressing a toxic pollutant that was initiated and adopted by the states and provinces and which explicitly goes beyond federal requirements in both the U.S. and Canada. The Plan includes 45 specific elements in 6 Action Areas. Given the widespread nature of mercury pollution, its classification as a PBT pollutant and the extensive data indicating that children and important natural resources were at risk in the region, the plan endorsed a precautionary approach to addressing mercury pollution and impacts. The plan explicitly calls for comprehensive actions to the problem that crosses traditional media, programmatic and political boundaries. It established a regional goal of virtually eliminating anthropogenic mercury releases, with an interim 50% reduction target by 2003. Subsequently, a 75% reduction goal was established for 2010 and adopted by the Governors and Premiers by resolution. The MAP established a regional task force to implement the plan; specified strict emission limits for major sources (which are considerably more stringent than federal requirements); supports pollution prevention efforts to reduce mercury use in products and increased collection and recycling of mercury-added products where environmentally preferable alternatives do not exist; directed state and provincial agencies to implement outreach and education programs about mercury and coordinate environmental monitoring efforts to track results; and called for the retirement of the federal strategic mercury stockpile. To date, the plan has been a remarkable success. All states have developed and, in many cases, implemented legislative and regulatory actions to address mercury sources including those that result in atmospheric deposition as well as product reduction.

Maine has aggressively pursued mercury reductions within the state. In 1998, legislation was passed to reduce the discharge of mercury from the only licensed mercury discharge source (and largest air emission source) in the state. This resulted in the closure of that facility (chlor-alkali) in 2000 and a subsequent RCRA-required cleanup of the site. In 2001, Maine adopted, by statute, updated water quality and fish tissue criteria for mercury. Additionally, mercury reduction was implemented for all wastewater facilities (even if there were no known specific sources in the wastewater system). Legislation and rules have been passed to control or eliminate a number of additional mercury sources:

PL 1997 Chapter 722 An Act to Reduce Mercury Use and Emissions

PL 1999 Chapter 500 An Act to Amend the Water Quality Laws to Establish a New Standard for Mercury Discharges

PL 1999 Chapter 779 an Act to Reduce the Release of Mercury into the Environment from Consumer Products

PL 2001 Chapter 373 An Act to Further Reduce Mercury Emissions from Consumer Products

PL 2001 Chapter 385 An Act to Address the Health Effects of Mercury Fillings

PL 2001 Chapter 418 An Act to Implement Recommendations of the Department of Environmental Protection on Ambient Water Quality Criteria for Mercury

PL 2001 Chapter 620 An Act to Phase Out the Availability of Mercury-added Products

PL 2001 Chapter 656 An Act to Prevent Mercury Emissions when Recycling and Disposing of Motor Vehicles

PL 2003 Chapter 301 An Act to Require the Installation of Dental Amalgam Separator Systems in Dental Offices.

PL 2003 Chapter 221 An Act to Reduce Mercury Use in Measuring Devices and Switches.

Rules:

DEP Chapter 870 Labeling of Mercury-added Products

DEP Chapter 519 Interim Effluent Limitations and Controls for the Discharge of Mercury

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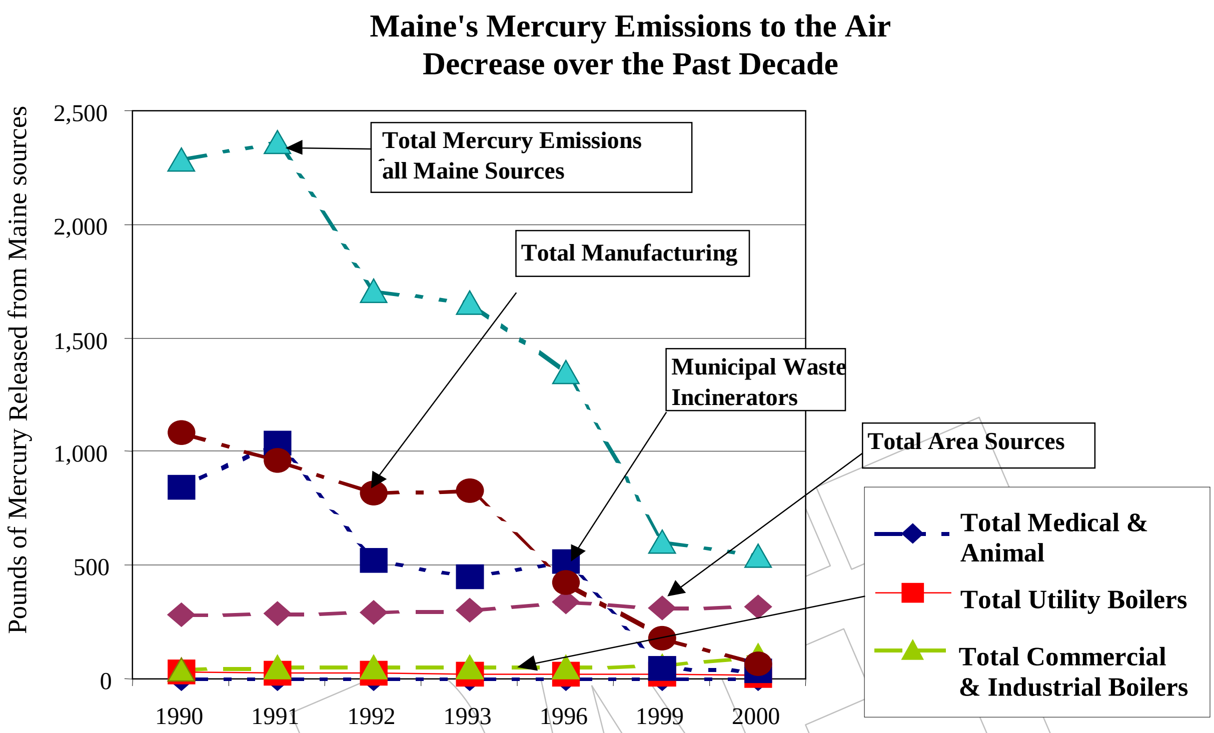

Figure 4-1 Maine Mercury Emissions: 1990 - 2000

Most reductions in Maine mercury emissions are due to:

- The closure of the Chloro-Alkali production facility in Orrington,
- New regulations on Municipal Waste Incinerators,
- The elimination of Medical Waste Incineration in Maine, and
- Removal of mercury from the waste-stream (dental amalgam, batteries, etc).

Any increased area source emissions are due to:

- Increased commercial and industrial use of coal and wood for fuel, and
- Population increases that in turn result in greater releases from landfills, laboratories, dentists, paint, lamps, and consumer products.

This figure above does not include mercury transported in from out-of-state, mercury releases from mobile sources like cars and trucks, or releases from natural sources. The majority of the area source emission estimates are based on national average testing results, rather than Maine-specific data. The Department's confidence in the accuracy of the data varies with each category, with greater confidence for the larger categories. The largest category with the least certainty is mercury releases from residential wood combustion.

Reference: DEP mercury emissions inventory 2003, which is based on Stack Test Data, Emission Factors in EPA's Factor Information Retrieval (FIRE) Data System version 6.23, & US Census Data.

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Section 4-2 ASSESSMENT CRITERIA

The following tables provide the designated use categories and the criteria (with references) used to assess a water's attainment of the use. A determination of non-attainment is only made when there is documented evidence (e.g. monitoring data) indicating that one or more criteria are not attained. Such data are also weighed against evidence that there are plausible human-caused factors that may contribute to the violation of criteria (38 MRSA Section 464.4.C).

Rivers and Streams

Designated Use	Criteria for Attainment
Drinking water supply after disinfection/treatment	• Ambient Water Quality Criteria (Maine DEP Chapter 530.5) • General provisions: floating/settleable solids, pH, radioactive substances, (38 MRSA Section 464.4.A)
Aquatic life use support	• Biomonitoring criteria (Maine DEP Chapter 579) • Dissolved oxygen (38 MRSA Section 464.13, 465.1-4) • Ambient Water Quality Criteria (Maine DEP Chapter 530.5) • Support of indigenous species • Wetted habitat (Maine DEP Chapter 581) • General provisions: floating/settleable solids, pH, radioactive substances, (38 MRSA Section 464.4.A)
Fishing	• Support of indigenous fish species • No consumption advisory (established by Maine DHS) • General provisions: floating/settleable solids, pH, radioactive substances, (38 MRSA Section 464.4.A)
Recreation in and on the water	• *E. coli* bacteria (38 MRSA Section 465, geometric mean) • Water color (38 MRSA Section 414-C) • General provisions: floating/settleable solids, pH, radioactive substances, (38 MRSA Section 464.4.A)
Navigation, hydropower, agriculture/industrial supply	• General provisions: floating/settleable solids, pH, radioactive substances, (38 MRSA Section 464.4.A)

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Lakes and Ponds

Designated Use	Criteria for Attainment
Drinking water supply after disinfection/treatment	• Ambient Water Quality Criteria (Maine DEP Chapter 530.5) • General provisions: floating/settleable solids, pH, radioactive substances, (38 MRSA Section 464.4.A)
Aquatic life use support	• Trophic state (38 MRSA Section 465-A, DEP Chapter 581) • Ambient Water Quality Criteria (Maine DEP Chapter 530.5) • Wetted habitat (DEP Chapter 581)

	• General provisions: floating/settleable solids, pH, radioactive substances, (38 MRSA Section 464.4.A)
Fishing	• Support of indigenous fish species • No consumption advisory (established by Maine DHS) • General provisions: floating/settleable solids, pH, radioactive substances, (38 MRSA Section 464.4.A)
Recreation in and on the water	• *E. coli* bacteria (38 MRSA Section 465-A, geometric mean) • Trophic state (38 MRSA Section 465-A, DEP Chapter 581) • General provisions: floating/settleable solids, pH, radioactive substances, (38 MRSA Section 464.4.A)
Navigation, hydropower, agriculture/industrial supply	• General provisions: floating/settleable solids, pH, radioactive substances, (38 MRSA Section 464.4.A)

Estuarine and Marine Waters

Designated Use	Criteria for Attainment
Marine life use support	• Ambient Water Quality Criteria (Maine DEP Chapter 530.5) • Dissolved oxygen (38 MRSA Section 465-B) • Narrative biological standards (38 MRSA Section 465-B) • General provisions: floating/settleable solids, pH, radioactive substances, (38 MRSA Section 464.4.A)
Shellfish propagation and harvest	• National Shellfish Sanitation Program (as assessed by DMR) • No consumption advisory (Maine DHS) • General provisions: floating/settleable solids, pH, radioactive substances, (38 MRSA Section 464.4.A)
Aquaculture	• General provisions: floating/settleable solids, pH, radioactive substances, (38 MRSA Section 464.4.A)
Fishing	• Support of indigenous fish species • No consumption advisory (Maine DHS) • General provisions: floating/settleable solids, pH, radioactive substances, (38 MRSA Section 464.4.A)
Recreation in and on the water	• Enterococcus bacteria (38 MRSA Section 465-B, geometric mean) • General provisions: floating/settleable solids, pH, radioactive substances, (38 MRSA Section 464.4.A)
Navigation, hydropower, industrial supply	• General provisions: floating/settleable solids, pH, radioactive substances, (38 MRSA Section 464.4.A)

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Data Interpretation

It is not common to have complete and consistent water quality data, therefore, some interpretation of data is required in making a final assessment. Data from unique events such as a spill, accident, short duration license exceedence, or flood are not used in an assessment determination. The following general principles for each criteria type are used in making an assessment:

Biomonitoring Criteria: Assessment based on probability results of the biocriteria models, attainment >0.6. Professional judgement may be used in accordance with the procedures in Maine DEP Chapter 579.

Lake Trophic State: Assessment is based on measures of transparency, chlorophyll a, total phosphorus and color (see Table 4-1). When lakes lack this information, a trophic determination made by DIF&W is used, if available. Their determination is more subjective and generally applies to the lake system as a whole including adjacent wetlands and fisheries productivity. Trophic determination is tracked by source (DEP or DIF&W) in the assessment database.

Table 4-1* Lake Trophic State Parameters and Guidelines

Numerical Guidelines for Evaluation of Trophic Status in Maine			
(Note: Dystrophy is not often evaluated as a trophic category separately from categories below.)			
	Trophic Status		
Parameter[1]	**Oligotrophic**	**Mesotrophic[2]**	**Eutrophic**
SDT[3]	> 8 meters	4-8 meters	< 4 meters
CHL a	< 1.5 ppb	1.5 – 7 ppb	> 7 ppb
Total Phosphorus[3]	< 4.5 ppb	4.5 – 20 ppb	>20 ppb
TSI[3,4]	0-25	25-60	>60 and/or repeated algal blooms

[1] SDT, CHL a, and Total Phosphorus based on long-term means.
[2] No repeated nuisance algal blooms.
[3] If color is > 30 Standard Platinum Units (SPU) or not known, chlorophyll a concentration (CHL a), dissolved oxygen and best professional judgment used to assign trophic category.
[4] TSI = Trophic State Indices are calculated when adequate data exists and color is at or below 30 SPU.

* This table is a duplicate of Table 4-19 in the Lakes Section of this Chapter (appears twice for convenience).

Support of Indigenous Species: Assessment based on the known absence of a species that previously was documented as indigenous to a waterbody (ME Department of Inland Fisheries and Wildlife records).

Dissolved Oxygen: Assessment is based on the results of repeated measurements. Single excursions below the criteria, or excursions within the range of sampling or instrument error (as established in a Quality Assurance Project Plan) are generally disregarded. Assessment may also be based on the use of water quality models (e.g. QUAL2E) based on present or expected loadings. New legislation provides that dissolved oxygen in the thermocline and deeper waters of a riverine impoundment will not be used for measurement of water quality attainment.

Ambient Water Quality Criteria: Assessment is based on repeated measurements. Single excursions above the criteria, or excursions within the range of sampling or instrument error (as established in a Quality Assurance Project Plan) are generally disregarded. Assessment may also be based on the use of water quality models (e.g. dilution models) based on present or expected loadings.

Bacteria: Assessment is based on repeated measurements to establish an annual geometric mean. Instantaneous (single sample) criteria are not used for water quality assessment due to the high variability associated with a single measurement. There must be a plausible human source of the bacteria for an impairment determination to be made (38 M.R.S.A Section 465, 465-A, 465-B)

Water Color: Assessment based on repeated measurements of discharge performance data (pulp and paper discharges only).

General Provisions: pH based on repeated measurement (between 6.0 and 8.5 for freshwaters; 7.0 and 8.5 for marine waters), however, certain naturally occurring waterbody types (e.g. bogs, aquifer lakes, high elevation lakes) or events may naturally have low pH and affect downstream waters. Use impairment from solids is subjectively determined. Radioactivity is not presently monitored.

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Section 4-3 INTEGRATED REPORT LISTS OF CATEGORIES 1 THROUGH 5

Table 4-2 Summary of State Waters Attaining and Not Attaining Standards

Waterbody Type	Total Assessed for Attaining of WQ Standards – Assessed for Designated Uses	Total with Insufficient Data for Assessment – Not Assessed for Any Designated Uses (Category 3)	Total Attaining All WQ Standards - Supporting All Designated Uses (Category 1)	Total Attaining At Least One Standard – Supporting at Least One Use, But Not All Standards Assessed (Category 2)	Total Not Attaining One or More WQ Standards – Not Supporting One or More Uses – But Not Needing a TMDL (Category 4)	Total Not Attaining One or More WQ Standards – Not Supporting One or More Uses – and TMDL is Needed
River & Stream Miles	31,199.0	269.2	4,328.3	25,414.1	421.6	765.8
Number of Lakes/Ponds	5,782	20	2,855	2,865	19*	23
Lake & Pond Acres	987,172	26,788	285,573	568,990	86,936*	18,885
Estuarine/Ocean Square Miles	2,846.0	4.8	2,660.3	92.4	17.79	70.70
Freshwater/Tidal Wetland Acres	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]

* These figures do not include those lakes listed under Category 4-B-3 for atmospheric deposition of Mercury.
[1] "N/A" means "Not Assessed".

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Table 4-3 Individual Designated Use Support Summary for Rivers and Streams

CWA Goals	Designated Use	Size Fully Supporting – Attaining WQ Standards (miles)	Size Not Fully Supporting – Not Attaining WQ Standards (miles)	Size Not Attainable – UAA Performed (miles)
Protect & Enhance Ecosystems	Aquatic Life	30,661.4	537.6	0
Protect & Enhance Public Health	Fish Consumption*(Mercury) Fish Consumption (other) Swimming (primary and secondary contact) Drinking Water Source	0 30,582.6 31,054.2 31,195	(31,199) 616.4 144.8 4.0	0 0 0 0
Social & Economic	Agricultural (designated use provisionally assigned) Industrial Supply Water Hydropower Navigation	31,199 31,199 31,199 31,194.8	0 0 0 4.2	0 0 0 0

* All freshwaters are listed for a consumption advisory due to mercury (Category 4-B-3). The fish consumption (other) listing is for consumption advisories other than that caused by mercury (these waters also have a mercury advisory).

Table 4-4 Individual Designated Use Support Summary for Maine Lakes

CWA Goals	Designated Use	Size Fully Supporting – Attaining WQ Standards (Acres)	Size Not Supporting – Not Attaining WQ Standards (Acres)	Size Not Attainable – UAA Performed
Protect & Enhance Ecosystems	Aquatic Life Support	881,351	105,821	
Protect & Enhance Public Health	Fish Consumption (Hg)	0	987,172	
	Swimming	955,264	31,908	
	Secondary Contact	987,172	0	
	Drinking Water Source Water	987,172	0	
Social & Economic	Agricultural	987,172	0	
	Industrial	987,172	0	
	Cultural or Ceremonial	987,172	0	
	State Defined: 1. Hydropower & Navigation	987,172	0	

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Table 4-5 Individual Designated Use Support Summary for Estaurine and Marine Waters

CWA Goals	Designated Use	Size Fully Supporting – Attaining WQ Standards (square miles)	Size Not Supporting – Not Attaining WQ Standards (square miles)	Size Not Attainable – UAA Performed (square miles)
Protect & Enhance Ecosystems	Aquatic Life	0	0.5	0
Protect & Enhance Public Health	Fish Consumption[1]	0	2,845.99	0
	Shellfish Consumption[2]	2,562.15	283.84	0
	(excluding lobster tomalley)	0	0	
	Shellfish Consumption[3] (lobster tomalley)	0	2,845.99	0
	Swimming (primary and secondary contact)	2,845.97	0.02	0
Social & Economic	Fishing	2,845.97	0	0
	Aquaculture	2,845.97	0	0
	Shellfish harvesting	2,845.97	0	0
	Navigation	2,845.97	0	0
	Industrial supply water	2,845.97	0	0
	Hydropower	2,845.97	0	0

[1] Based on a statewide fish/shellfish consumption advisory
[2] Partial support does not include statewide advisories for mercury in fish or dioxin in lobster tomalley.
[3] Based on a statewide consumption advisory on lobster tomalley.

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Table 4-6 Total Sizes of Category 4 and 5 Impaired Rivers and Streams by Causes/Stressors

Cause/Stressor Type	Size Impaired (miles)
Bacteria	144.8
Bacteria (CSO-source)	Variable
Dissolved oxygen	391.6
Toxics	-
Priority Organics	4.0
Pesticides (DDT)	222.1
Dioxins/PCBs	394.3
Metals	10.4
PH	1.0
Nutrients	87.8
Aquatic Life Criteria (integrated effects)	274.5
Habitat	17.2

Table 4-7 Total Sizes of Waters Impaired by Causes/Stressors for Maine Lakes

Cause/Stressor Type	Size Impaired (acres)
Flow Alteration	65,832
Methyl Mercury (fish tissue)	987,172
Nutrients: Phosphorus	32,687
Organic Enrichment	35,254
Siltation	31,414
Taste	3,845
Turbidity	7,865

(From Table 4-4, page 4-15 of 1997 305(b) Guidance)

Table 4-8 Total Sizes of Waters Impaired by Causes/Stressors for Maine Lakes by Listing Category and Magnitude

Listing Category	Cause/Stressor Type	High Magnitude		Med-Low Magnitude		Totals	
		Size (acres)	Number	Size (acres)	Number	Size (acres)	Number
4A	Nutrients: Phosphorus	0	0	20,470	9	20,470	9
	Organic Enrichment	634	1	20,470	9	21,104	10
	Siltation	0	0	12,922	6	12,922	6
	Taste and Odor	0	0	3,845	1	3,845	1
4C	Flow Alteration	65,832	9	0	0	65,832	9
	Siltation	0	0	7,865	1	7,865	1
	Turbidity	0	0	7,865	1	7,865	1
4D	Methyl Mercury (fish tissue)	987,172	5,782	0	0	987,172	5,782
5A	Nutrients: Phoshorus	85	1	12,132	19	12,217	20
	Organic Enrichment	6,268	2	7,882	17	14,150	19
	Siltation	0	0	10,627	13	10,627	13

Table 4-9 Total Sizes of Category 4 and 5 Impaired Estuarine and Marine Waters by Causes/Stressors

Cause/Stressor Type	Size Impaired (square miles)
Bacteria	67.5
Bacteria (CSOs)	Variable
Dissolved oxygen	5.7
Sediment Oxygen Demand	0.8
Toxics	
Metals-mercury	12.2
Metals-copper	0.9
PAHs	1.2
PCBs	12.2
Dioxins	12.2
Aquatic Life	1.2
Habitat	0.5

Table 4-10 Total Sizes of Category 4 and 5 Waters Impaired by Source for Rivers and Streams

Source Category	Size Impaired (miles)
Industrial Point Sources	338.8
Municipal Point Sources	163.3
Combined Sewer Overflows	Variable
Aquaculture Point Sources	11.5
Resource extraction (mining)	4.3
Hazardous waste (Superfund sites, etc.)	46.6
Waste (solid) disposal	11.1
Nonpoint Sources	-
Agriculture NPS	134.6
Industrial site NPS	13.2
Urban NPS/Stormwater	83.2
General development NPS	63.7
NPS (unspecified)	137.8
Habitat alteration	46.2
Impoundment	56.2
Flow modification/withdrawal	49.6
Eutrophic (impaired) Lake Source	37.0
Atmospheric Deposition (mercury deposition)	(31,199)
Unknown Source	26.7

Table 4-11 Total Sizes of Waters Impaired by Sources for Maine Lakes

Source Category	Size Impaired (acres)
Municipal Point Sources	4,288
Agricultural Runoff	30,561
Atmospheric Deposition	987,172
Hydromodification	65,832
Internal Nutrient Cycling	11,444
Landfill	1,849
Stormwater	39,101
Unknown Source	1,869

Table 4-12 Total Sizes of Waters Impaired by Sources for Maine Lakes by Listing Category and Magnitude

Listing Category	Source	High Magnitude		Med-Low Magnitude		Totals	
		Size (acres)	Number	Size (acres)	Number	Size (acres)	Number
4A	Municipal Point Source – Major	0	0	4,288	1	4,288	1
	Agriculture	0	0	19,388	7	19,388	7
	Internal Nutrient Cycling	0	0	9,334	3	9,334	3
	Stormwater	1,534	2	19,570	8	21,104	10
	Unknown	0	0	1,823	1	1,823	1
4C	Hydromodification	65,832	9	0	0	65,832	9
4D	Atmospheric Deposition	987,172	5,782	0	0	987,172	5,782
5A	Agriculture	6,433	8	4,740	7	11,173	15
	Internal Nutrient Cycling	30	1	2,080	2	2,110	3
	Landfill	429	2	1,420	1	1,849	3
	Stormwater	6,547	3	11,450	14	17,997	17
	Unknown	46	1	0	0	46	1

Table 4-13 Total Sizes of Waters Impaired by Sources for Estaurine and Marine Waters

Source Category (examples)	Size Impaired (square miles)
Industrial Point Sources	2,845.97
Municipal Point Sources / Overboard Discharge	244.7
Combined Sewer Overflows	Variable
Urban Runoff/Storm Sewers	51.7
Atmospheric Deposition	(2,845.97)

Section 4-4 RIVERS / STREAMS

Water Classification Program

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Related Website: www.maine.gov/dep/blwq/docmonitoring/classification/index.htm

Maine has four water quality classes of rivers and streams: AA, A, B, and C (38 M.R.S.A. Section 465). Each classification assigns designated uses, water quality criteria (narrative and numeric), and may place specific restrictions on certain activities (Table 4-14). Definitions of terms used in the classfication are provided in 38 M.R.S.A. Section 466.

Class AA waters are managed for their outstanding natural ecological, recreational, social, and scenic qualities. Direct discharge of wastewater, dams, and other significant human disturbances are prohibited.

Class A waters are managed for high quality with limited human disturbance allowed. Direct discharges are allowed but highly restricted.

Class B waters are general-purpose water and are managed to attain good quality water. Well-treated discharges with ample dilution are allowed.

Class C waters are managed to attain at least the swimmable-fishable goals of the federal Clean Water Act and to maintain the structure and function of the biological community.

Table 4-14 Maine Water Quality Criteria for Classification of Fresh Surface Waters (38 MRSA §465)

	Dissolved Oxygen Numeric Criteria	Bacteria (*E. coli*) Numeric Criteria	Habitat Narrative Criteria	Aquatic Life (Biological) Narrative Criteria
Class AA	as naturally occurs	as naturally occurs	Free flowing and natural	No direct discharge of pollutants; ***as naturally occurs***
Class A	7 ppm; 75% saturation	as naturally occurs	Natural	***as naturally occurs***
Class B	7 ppm; 75% saturation	64/100 ml (g.m.*) or 427/100 ml (inst.*)	Unimpaired	Discharges ***shall not cause adverse impact*** to aquatic life in that the receiving waters shall be of sufficient quality to ***support all aquatic species indigenous to the receiving water without detrimental changes to the resident biological community***.
Class C	5 ppm; 60% saturation	142/100 ml (g.m.*) or 949/100 ml (inst.*)	Habitat for fish and other aquatic life	Discharges ***may cause some changes*** to aquatic life, provided that the receiving waters shall be of sufficient quality to ***support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community***.

* "g.m." means geometric mean and "inst." means instantaneous level

Maine law requires that at least once every three years, the Department review the classification system and make recommendations to the Board of Environmental Protection for changes. In 2002-03, the Department conducted statewide workshops and the Board held hearings that resulted in recommendations to the Maine Legislature for the upgrade of part or all of 75 rivers and streams of which 61 were passed by the Legislature (P.L. 2003 Chapter 317). The 14 remaining segments are being reconsidered in a later session. The current distribution of these four water quality classes are summarized in Table 4-15:

Table 4-15 Percent Distribution of River/Stream Water Classes

Class	Percent of Total Miles
AA	5.8 %
A	44.1 %
B	47.9 %
C	2.2 %

Summary of Statewide River and Stream Attainment Status

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This Integrated Assessment report requires the assignment of each Assessment Unit into one of five categories (see the Assessment Methodology Section). A water is determined to be impaired if it does not attain one or more of the uses assigned by its classification as determined by the criteria assigned to that water class. The overall use attainment summary is provided in Table 4-3. This use attainment assessment reports on 31,199 miles of rivers and streams provided in the ADB (see discussion of extent of state's waters in Chapter 3).

Category 1. The 2004 assessment assigned 4,328 miles (13.9%) of rivers and streams to Category 1 (fully attaining*). This is an increase of 3,256 miles from the 2002 assessment. The Department has determined through monitoring and evaluation that large areas of the state should be included in this category where there is significant protection afforded by either state or private conservation efforts. Maine is fortunate to have entire Assessment Units where there is no human habitation, few roads and only minimal disturbance (typically a well managed forestry operation that are well buffered to protect water quality).

Category 2. The 2004 assessment assigned 25,414 (81.5%) miles of rivers and streams to Category 2 (fully attaining*). This is a decrease of 3,272 miles from the 2002 assessment. Most of these miles have been moved to Category 1. Eight segments, previously listed as impaired (Category 4 or 5) are now found to be in attainment and have been assigned to Category 2. (see Table 8-1).

Category 3. The 2004 assessment assigned 269 (0.9%) miles of rivers and streams to Category 3 (attainment undetermined*). This is an increase of 19 miles (2 segments) from the 2002 assessment.

Category 4. The 2004 assessment assigned 440 (1.4%) miles of rivers and streams to Category 4 (impaired for one or more uses*). This is an increase of 20 miles from the 2002 assessment, waters that have had a TMDL completed or other enforceable controls applied. Category 4 impaired waters do not require the development of a Total Maximum Daily Load (TMDL) determination. Waters in Category 4 are placed into one of three subcategories: 4-A for waters that already have a TMDL (2 segments added from 2002 Category 5), 4-B-1 for waters where there is already an enforceable mechanism in place to bring the water into attainment (e.g. new wastewater discharge license) (1 segment added from 2002 Category 5), 4-C for waters where there is no pollutant involved in the impairment problem (3 segments removed from 2002 list to Category 2, I segment added from 2002 Category 5). For the 2004 listing, Maine has assigned all waters affected only by Combined Sewer Overflows (CSO) to Sub-category 4-B-2. See the discussion in the Listing Methodology section of this report (waters impaired by CSOs are also listed in other categories). CSO-impaired waters were previously listed in the 2002 report in Sub-category 5-B-2. For the 2004 listing, Maine has also assigned all waters affected by atmospheric mercury deposition to 4-B-3. See discussion in Listing Methodology section of the report (waters impaired by mercury consumption advisories are also listed in other categories*). Mercury-impaired waters were previously listed in the 2002 report in Sub-category 5-C.

* All freshwaters in Maine have an advisory for the consumption of fish due to the presence of mercury presumed to be from atmospheric deposition. The advisory is based on probability data that a stream, river, or lake may contain some fish

that exceed the advisory action level (Maine uses a lower action level of 0.2 mg/kg (edible portion) than that established by the USEPA). Any freshwater may contain both contaminated and uncontaminated fish depending on size, age, and species occurrence in that water. The advisory applies to all freshwaters because it may be impossible for someone eating a fish to be able to tell where the fish originated and whether or not it has a high level of mercury. This Integrated Water Quality Monitoring and Assessment Report does not consider this statewide advisory in establishing other category listings.

Category 5. The 2004 assessment assigned 737 miles (2.4%) of rivers and streams to Category 5 (impaired for one or more uses*). This is a net increase of only 15 miles (10 segments were added; 8 segments were removed from 2002 list, see Table 8-1) from the 2002 assessment. Additionally, 6 waters (31.7 miles) have draft TMDLs that will be completed for FY03. Category 5 impaired waters require the development of a Total Maximum Daily Load (TMDL) determination. Waters in Category 5 are placed into one of three subcategories: 5-A for waters impaired by pollutants, 5-B for waters impaired only by bacteria, 5-D for waters impaired by the residuals of “legacy” activities.

As with any assessment of this kind, the identification of impaired waters cannot be considered complete but rather is a reflection of the findings, to date, relative to the level of effort expended by the agency and other cooperating contributors. While new and expanded monitoring has identified many additional miles of impaired waters, this should not be interpreted as an indication that Maine’s waters are under some new or increasing threat. Rather, the State has been better able to assess its waters with improved monitoring tools and increased participation from cooperators. All of the new impaired listings appear to be due to conditions that have probably been in place for many years.

Causes and Sources of Impairment

Cause and stress type information is provided in Table 4-6. Sources of impairment are provided in Table 4-10.

The greatest number of impaired miles (631) are due to toxic contamination with dioxins, pesticides and PCBs accounting for most of those impaired miles (see the sections on Dioxin Monitoring and Surface Water Ambient Toxics programs). There has been no appreciable change in the impaired mileage assigned to each general cause (a small increase in bacteria-impaired and aquatic life-impaired waters, along with a small decrease in habitat-impaired waters).

Industrial point sources are the largest contributing source category and it should be noted that some industrial loads that are treated through municipal point sources are regarded as additional sources. These industrial sources account for all of the fish consumption listed waters where dioxins are the primary contaminant. There has been a combined reduction of about 50 miles in NPS-impaired waters (55-mile reduction attributed to agriculture). This is due in part to the removal of some NPS waters from Category 4 and 5, but are also due in part to updating the reassignment of potential sources for some waterbodies.

Main Stems of Major Rivers

Most of the mainstem rivers are in good condition and are attaining their classification (mostly Class B or C quality, although significant segments of the St. John, Allagash, East and West Branches of the Penobscot, St. Croix, and Kennebec Rivers are Class AA and A). The primary impairment issue on the larger rivers is fish consumption, with segments of the Androscoggin, Kennebec, Penobscot, Salmon Falls and Sebasticook Rivers listed in either Category 4 or 5. Tissue monitoring studies have

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found a progressive decline of dioxin and furan concentrations in fish tissue for some of these waters following process changes at many of the industrial facilities responsible for the contamination. There is an expectation that some of these waters may have their fish consumption advisories (for those compounds) relaxed or removed in future years (see the Dioxin Monitoring Program section). Impoundments on major rivers continue to create water quality problems that have yet to be resolved including the Androscoggin, Sebasticook, and Presumpscot Rivers. Recent legislation has relaxed dissolved oxygen requirements for deeper impoundments allowing some waters to be declared in attainment (e.g. Dolby Flowage on the West Branch Penobscot). Recent changes to flow management as a result of relicensing of hydropower facilities also brought impaired downstream segments into attainment (e.g. Kennebec River at Bingham). Dam removals, along with improved wastewater management have allowed an upgrade of classification of the lower Kennebec River to Class B, and the prospect for a similar upgrade to the lower Presumpscot River exists.

Small Streams

Most of the new listings in Category 5 are small urban streams. In recent years, the Department has emphasized the monitoring of these waters and, not surprisingly, the number of these types of waters has increased in the Category 5 list. Conversely, the Department has spent more effort to complete TMDL evaluations and otherwise take actions to remove larger waters with point sources of impairment from the list. That trend is now shifting as few point source problems remain. The greater part of TMDL activity is now being directed toward smaller waters with identified nonpoint source problems. Goosefare Brook in Saco is the first small, nonpoint source affected water with a completed TMDL report. Several TMDLs for such waters are in draft form and the greater expenditure of resources for the coming years is being directed at these waters (Table 3-3). One notable recovery has been Kennedy Brook in Augusta. This is a small urban stream and was previously listed for aquatic life impairment due to stormwater loading and the effects of development in its watershed. Stormwater interception has been completed in the watershed, aquatic life in the stream has responded, and it has now been moved from the Category 5 list to Category 2. It is encouraging to document improved water quality conditions and benefits as a direct response to these improved management strategies.

Toxics

Dioxin Monitoring Program

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In 1997 the Maine legislature enacted LD 1633 "An Act to Make Fish in Maine Rivers Safe to Eat and Reduce Color Pollution", the Dioxin/Color law [38 MRSA section 420(2)(I)]. The key requirement is that ‘a (bleach kraft pulp) mill may not discharge dioxin into its receiving waters after December 31, 2002. To determine compliance, there are interim tests and a final test. Two interim tests of effluent from the bleach plant, require that 1) TCDD (2378-tetrachlorodibenzo-p-dioxin, the most toxic of the 17 toxic dioxins and furans) must be below 10 ppq, parts per quadrillion or picograms per gram, pg/g by July 31, 1998 and 2) TCDF (2378-tetrachlorodibenzofuran) must be below the same detection limit by December 31, 1999. All of the mills passed both interim tests by the respective deadlines.

As the final test to confirm that there is no discharge by December 31, 2002, fish (or surrogate) below a bleached kraft pulp mill must have no more dioxin than fish (or surrogate) above the mill, the so-called "above/below (A/B) fish test". Since the development of the Above/Below (A/B) test began in 1997, the Department conducted more than 78 tests of different matrices, species, tissues, and sample types. No one test has been consistently the most sensitive, but in general, tests with fish filets were as sensitive or more so, than the other tests. In a report to the Maine legislature entitled 'Monitoring Dioxin in Maine, Overview, Update, Next Steps, dated March 31, 2003, DEP established that the A/B test would be done with bass and suckers for 2003. Above and below 2 mills, additional tests with caged mussels and semi-permeable membrane devices (SPMDs) were continued to determine their utility.

After evaluation of the 2003 results, DEP amended the A/B test in 2004 as follows:

- The test will utilize 3 separate tests: a) bass, b) suckers, and c) caged mussels.
- A preponderance of evidence (POE) approach will be used where passage of 2 of the 3 tests will be used to indicate no discharge.
- Because none of the tests are very sensitive, a mill must show no evidence of a discharge for 2 consecutive years before being deemed in compliance. Periodic testing is subsequent years will also be necessary to assure continued compliance.

Additional details may be found in (DEP, 2004).

Findings of the 2002-2003 Dioxin Monitoring Program and 2003 A/B test

Discharges from bleached kraft pulp and paper mills

- There is some evidence that all 5 bleached kraft pulp and paper mills may have continuing discharges of dioxin. At each mill at least one test found increased dioxin below the mill.
- A preponderance of evidence (POE) approach, however, initially suggests that there is no discharge from the International Paper mill in Jay or the SAPPI-Somerset mill in Skowhegan.
- Since only fish tests were conducted at the other 3 mills in 2003, no initial determination can be made at this time based on a POE approach.

The Above/Below (A/B) test will need to be continued in future years, as specified in statute, to determine final compliance of all 5 mills with the 'no discharge of dioxin' provision of the 1997 Dioxin/color law.

Surface Water Ambient Toxics (SWAT) Monitoring Program

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Maine's Surface Water Ambient Toxics (SWAT) monitoring program was established by the Maine legislature in 1994 (38 MRSA 420-B) "in order to determine the nature, scope and severity of toxic contamination in the surface waters and fisheries of the State". Advised by a Technical Advisory Group, DEP must prepare 5-year plans and annual workplans for implementation of the program.

The first 5-year plan, from 1994-1998, consisted of a screening survey of all major watersheds in the state. The results were a finding of significant contamination in fish, shellfish, macroinvertebrates and sediments from many parts of the state. One consequence of the survey was the expansion of the statewide fish consumption advisory for lakes (due to mercury), to all freshwaters in the state.

The second 5-year plan, from 1999-2003, focused on more definitive studies of issues identified in the initial statewide survey and exploration of newly emerging issues. One result was confirmation of residual high levels of DDE in fish from Aroostook County and subsequent fish consumption advisories. Some other studies include mercury in rainfall, and fish, development of a wildlife criterion value for mercury based on loons and fish-eating mammals, PCBs in wild and hatchery fish, endocrine disruption in blueberry sprays, contaminants in marine mussels and fish and seals, antibiotics in lobsters, and continued studies of freshwater macroinvertebrates. In 2003, due to state budget shortfalls, the program's total budget was reduced by 20%.

This year, 2004, will be the beginning of a new 5-year plan, which will be developed by DEP in consultation with the Technical Advisory Group and other state agencies. The budget is expected to be similar to that of 2003. It is anticipated that many of the same issues from the past few years will still need to be studied, in addition to some potential new issues, including a look at pharmaceuticals and flame retardants.

Aquatic Life Monitoring

Biological Monitoring of Rivers, Streams and Brooks

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Adoption of the Numeric Biocriteria Rule

On April 17, 2003 the Maine Department of Environmental Protection (MDEP) adopted numeric freshwater biocriteria in rule. The biocriteria rule describes the process that the MDEP uses to make decisions about attainment of aquatic life uses in rivers and streams. The rule describes protocols for biological sampling of benthic macroinvertebrates, laboratory analyses, modeling analysis of laboratory data, and selective use of expert judgment. Adoption of this rule quantitatively interprets Maine's existing narrative 'aquatic life' standards for each riverine water quality classification.

The Biological Monitoring Program

The Biological Monitoring Program of the Maine Department of Environmental Protection (MDEP) assesses the health of rivers and streams by evaluating the composition of resident biological communities. The program has been sampling locations throughout Maine since 1983, and by late summer of 2003 had established more than 724 monitoring stations on approximately 232 rivers and streams (see Figure 4-2 – next page). More than 1,300 macroinvertebrate samples are stored in an Oracle database and all stations are geo-referenced in the Department's GIS. Data collected in accordance with Maine's biocriteria protocol are analyzed using statistical models, whose results estimate the association of a sample to the four water quality classes defined by Maine's Water Classification Program. Findings of the Biological Monitoring Program are used to document existing conditions, identify problems, set water management goals, assess the progress of water resource management measures, and trigger needed remedial actions.

An algal monitoring program was begun in 1999. Nearly 200 samples have been collected from about 100 stations throughout the state. The purpose of this program is to provide information from a second biological assemblage in order to strengthen the interpretation of ecological condition. The algal monitoring program will also assist the Department in the development of river and stream nutrient criteria.

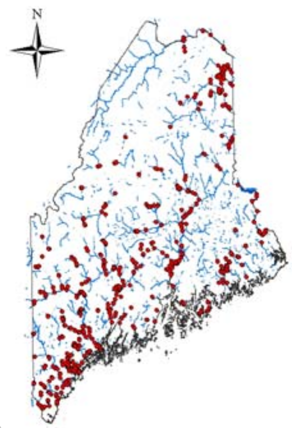

Figure 4-2 Biological Monitoring Stations in Maine

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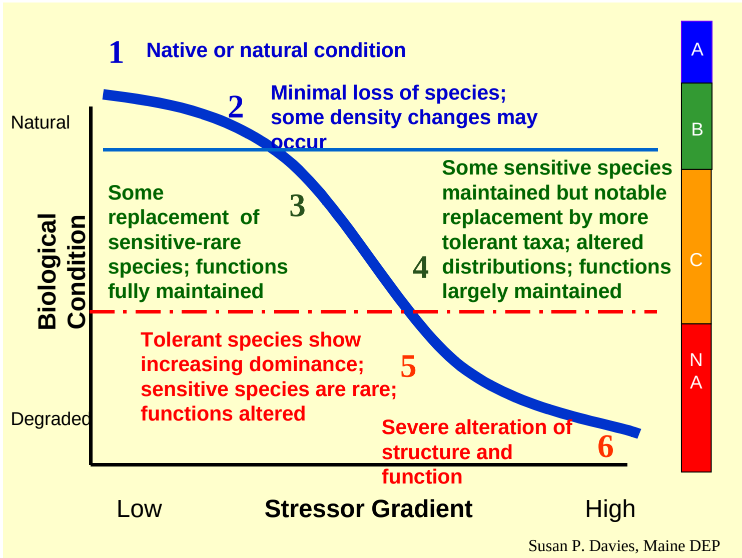
The Numeric Biocriteria Statistical Models

In the late 1980's, the MDEP quantified the narrative aquatic life goals for each water quality class by developing a probability-based statistical model to serve as an expert system. The model quantified the expert judgement of biologists. Biologists used agreed-upon decision rules to assign an aquatic life attainment classification (A, B, C, or non-attainment) for 144 samples of benthic data, based on the degree to which the sampled community conformed to one of the narrative aquatic life standards in Maine's statute. The samples evaluated represented 300 distinct taxonomic units and 70,000 organisms collected from rivers, streams, and riverine impoundments. Those data and their classification assignments were used as the baseline for construction of the expert system to evaluate future macroinvertebrate samples for water quality classification attainment. The original model was used from 1992 through 1999 when the model was recalibrated with an additional 229 sampling events. The recalibration resulted in relatively minor changes to the structure of the original model, involving simplification of the structure of two of the sub-models, the elimination of two poorly performing variables, and changes in model coefficients to account for the new data.

Maine's Tiered Aquatic Life Uses and the Biological Condition Gradient

Maine's aquatic life standards specify different levels (tiers) of water quality necessary to maintain designated aquatic life uses (Table 4-14). Maine's numeric criteria for aquatic life classes A, B, C and non-attainment are interpreted against the Biological Condition Gradient shown in Figure 4-3.

Figure 4-3 Position of Maine's tiered aquatic life uses on the Biological Condition Gradient



How does the MDEP decide what waterbodies and locations to monitor?

For purposes of biological monitoring, the MDEP divided the state into five major river basins, which are sampled on a 5-year rotational schedule (see Figure 4-4):

- Androscoggin;
- Kennebec and Mid-Coast;
- Penobscot, St. Croix and North Coastal Rivers;
- Piscataqua, Saco, and Southern Coast;
- St. John and Presumpscot.

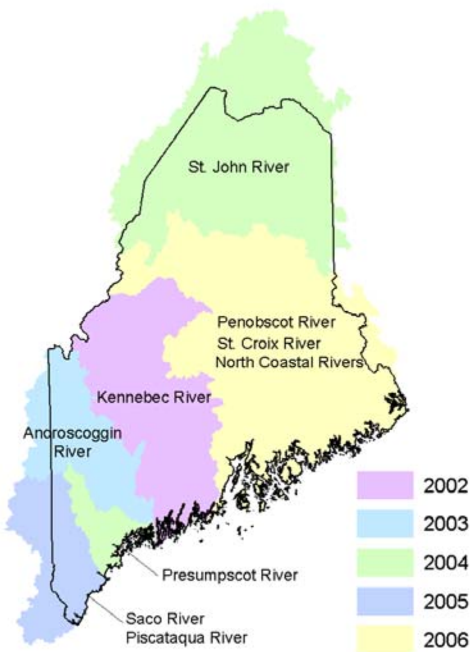


Figure 4-4 Rotating Basin Sampling Schedule

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The decision to monitor specific locations on a waterbody can be based on a variety of factors such as:

- prior knowledge of existing activities that could have a detrimental effect on a waterbody: sampling seeks to detect actual impacts on biological communities;
- knowledge of future potential threats to a waterbody: sampling can be done to collect baseline data before, for example, development occurs or a discharge is licensed; follow-up sampling can determine the effect, if any, on the biological community by said development or discharge;
- requirement/desire to monitor the effects of remediation activities or water quality management changes;
- desire to expand coverage of the monitoring program and to more fully document natural variability.

What happens if a waterbody is found to be below its assigned statutory class?

If the sample is found to be appropriate for analysis and if BPJ (best professional judgement) does not indicate that the model outcome may need to be adjusted, the stream reach will be determined to be in non-attainment of its statutory class. In some cases this decision is clear cut, while in other cases it may be deemed prudent to repeat the sampling the following season to confirm the outcome. Once the decision of non-attainment is made, a number of actions are required:

- other programs within the MDEP such as Licensing or Land Use Regulation are notified that water quality management changes are needed;
- the stream reach is listed on the federally required 303d list of impaired waterbodies;
- a TMDL (total maximum daily load) plan for certain pollutants must be developed.

What happens if a waterbody is found to attain a classification higher than its assigned statutory class?

A sampling outcome that attains an aquatic life classification higher than the classification assigned to the waterbody is subject to the statutory provisions for antidegradation, meaning if the finding is confirmed under critical (worst-case) water quality conditions, those higher aquatic life conditions must be maintained. The MDEP will:

- confirm the finding by resampling;
- confirm that the higher aquatic life quality exists even at maximum allowed pollutant loads and worst case conditions: if so, those higher aquatic life conditions must be maintained;
- if other standards (dissolved oxygen, bacteria, habitat) are also attaining the next higher class, the MDEP may propose the waterbody for a classification upgrade at the next triennial water quality standards review.

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Reports of Fish Kills

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The Department of Environmental Protection documents all pollution-caused fish kills. For this 2002-2003 reporting period, there were two documented fish kills although neither resulted in loss of fish within the State's waters.

- In September 2002, a black liquor spill at an industrial facility on the St. Croix River resulted in the loss of fish (Atlantic salmon parr) at a hatchery in New Brunswick, Canada that draws water from the river. An investigation found no dead fish within the St. Croix River itself.
- In July 2003, dead fish (~200 minnows) were reported from a private pond connected to a tributary of Daigle Brook (a Category 5 listed water in New Canada). The brook drains extensive crop and pastureland, a potential source of pollutant, however, no dead fish were observed in the brook. No cause for the fish kill was ever determined, although eutrophic conditions in the private pond may have contributed to the kill.

Section 4-5 Lakes / Ponds

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Physical Extent

The total area of Maine's 5,782 Lakes and Ponds that have been assigned an identification number is estimated as 987,172 acres or approximately 5% of the state's surface area.[1] The Bureau of Land and Water Quality is in the process of finalizing a GIS-based spatial dataset that should be ready to use for the 2006 assessment cycle. These spatial features were originally digitized as displayed on USGS 7.5-minute topographic maps; however, some features have been added or updated based on aerial photography in the form of USGS digital ortho quadrangles (DOQs). Lake and pond features were placed in a layer containing 33,065 polygons (1,000,526 acres). Lake identification numbers have been entered into the attribute table for approximately 6,000 of these polygons (971,884 acres). The total acreage of the 27,038 pond polygons without lake identification numbers is 28,642 acres, thus most of these are less than 1 acre in area. Some larger impoundments that are assigned a lake identification number are not included in this layer because they occur in the 'rivers' polygon layer. This is an example of an issue that needs resolution before deriving statistics for lakes from this GIS system. Nevertheless, we have a high degree of confidence that the lakes defined in past assessments as 'significant' will continue to be defined as such in future assessments.

[1] Number and surface area obtained from Maine Department of Inland Fisheries and Wildlife's Lake Index file, which is being converted to a GIS dataset. Entire surface of border waters is included. The Maine DEP believes that the DIFW Lake Index file (determined from 15' USGS topographic maps; 1:62,500 scale) provides a more accurate estimate of lake numbers and acres than the USEPA RF3/DLG estimates (based on maps having 1:100,000 scale).

For more information on the GIS lakes data development project:

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Economic Contribution

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In addition to providing valuable natural habitat for fish and wildlife communities, Maine lakes are an integral part of Maine's economy. Lake use contributes more than $1.8 billion into the State's economy each year. In fact, lakes support over 52,000 jobs statewide. The total net economic value of Maine's Great Ponds (lakes and ponds 10 or more acres in surface area) is at least $6.7 billion dollars annually (July 1996 dollars). Surveys show that water clarity, quality of swimming, and scenic beauty are important to most people when they choose which lake to visit or where to buy property. A noticeable gain or loss in water quality could change statewide use rates by up to 13% (1.6 million user-days) each year. The potential loss in property value if water clarity declines could be as much as $36,000 per property. This makes lake protection a priority for the entire state.

Lake Classification and Designated Use Attainment Status

Statutory Classification

Maine statute (38 M.R.S.A. Section 465-A) has designated one standard (GPA) for the classification of great ponds and natural lakes less than 10 acres in size. Specifically, Class GPA waters:

A.) Class GPA waters shall be of such quality that they are suitable for the designated uses of drinking water after disinfection, recreation in and on the water, fishing, industrial process and cooling water supply, hydroelectric power generation and navigation and as habitat for fish and other aquatic life. The habitat shall be characterized as natural.

B.) Class GPA waters shall be described by their trophic state based on measures of the chlorophyll "a" content, Secchi disk transparency, total phosphorus content and other appropriate criteria. Class GPA waters shall have a stable or decreasing trophic state, subject only to natural fluctuations and shall be free of culturally induced algal blooms which impair their use and enjoyment. The number of Escherichia coli bacteria of human origin in these waters may not exceed a geometric mean of 29 per 100 milliliters or an instantaneous level of 194 per 100 milliliters.

C.) There may be no new direct discharge of pollutants into Class GPA waters. Aquatic pesticide treatments or chemical treatments for the purpose of restoring water quality approved by the department and storm water discharges that are in compliance with state and local requirements are exempt from the no discharge provision. Discharges into these waters licensed prior to January 1, 1986, are allowed to continue only until practical alternatives exist. No materials may be placed on or removed from the shores or banks of a Class GPA water body in such a manner that materials may fall or be washed into the water or that contaminated drainage *therefrom may flow or leach into those waters, except as permitted pursuant to section 480-C. No change of land use in the watershed of a Class GPA water body may, by itself or in combination with other activities, cause water quality degradation that would impair the characteristics and designated uses of downstream GPA waters or cause an increase in the trophic state of those GPA waters.*

Attainment of Classification

Maine lakes exhibit a great amount of diversity, as does the state's topography and population. Maine's 5,782 lakes that are listed on DIFWs (Department of Inland Fisheries and Wildlife) Lake Index span a range in size of 1 acre to 74,890 acres (Moosehead Lake). Of these, 804 lakes are currently listed as 1 acre in size and only 11 are greater than 10,000 acres. Similarly, Maine lakes range from approximately 1 foot in depth to 316 feet deep (Sebago Lake). However, these 5,782 listed lakes include many waters that are small and/or shallow and are therefore not at all representative of a true Maine lake but are more representative of transition waters or open water in a wetland. With respect to designated uses, Class GPA does not expect more from a small, shallow lake than it can be reasonably expected to attain, given its physical limitations.

The Department is highly confident that some of the GPA designated uses are attained by all lake waters in Maine. This high level of confidence is based on a classification approach that includes realistically attainable uses. These uses include industrial process and cooling water supply, hydroelectric power generation, and navigation. There is no credible reason to believe that these uses are impaired in any of Maine's lake waters. Thus, these uses are not designated as 'assessed' uses in the same manner as the more critical uses: drinking water, fish consumption, recreation in/on (primary contact or swimming), and aquatic life support.

Municipal populations range from 1 to approximately 65,000 persons according to the 2000 U.S. Census data (~422 municipalities) with an additional 383 unorganized townships having no population. Municipalities having the highest populations are generally located along the larger rivers or in coastal areas. Development corridors typically fall around the major roadways in the state (e.g., Interstate 95). Much of Maine's land area has considerable relief (change in elevation) or is considered remote (having no distributed utilities such as electricity or phone lines). Such a wide range in lake water types and geographic settings make it necessary to focus lake assessment efforts in areas most likely to have lake waters that do not attain Class GPA.

For management purposes, the state designated a subset of the total population of lake as 'Significant Lakes' as requested by EPA under Section 314 in the early 1990s. Significant Lakes are defined as publicly owned lakes for which bathymetric / morphometric surveys exist, vulnerability modeling has been performed, or for which some trophic data has been gathered. These are generally the lakes that the state is most actively engaged in managing or assessing. Lakes that are not considered 'significant' are tiny and/or shallow waters that are not managed as a 'typical' lake water. Table 4-16 summarizes information on both the lakes ('all lakes') that are listed in DIFWs Lake Index and on State designated 'significant lakes'.

Table 4-16 "All" and "Significant" Lake Category Information

Maine Lake Population Summary		
	Number	**Acres**
All Lakes	5,782 (100%)	987,172 (100%)
Significant Lakes	2,314 (40%)	959,193 (97%)

Attainment Evaluation Criteria

This section includes specific guidelines for determining whether or not a lake is in attainment of each designated use.

Designated Use: Aquatic Life Support

Attainment: *Lakes exhibiting stable or decreasing (improving) trends in trophic state, natural water-level fluctuations and consistency in dominant species composition.*

Non-attainment: *Lakes that experience a deteriorating trend, extreme artificial water level fluctuations, severe turbidity, or shift in dominant species composition.*

Such lakes may exhibit a deteriorating trend in trophic state as indicated by statistically valid analysis of transparency data, or, a combination of data examination (dissolved oxygen, chlorophyll, and total phosphorus in addition to transparency) and best professional judgement. Lakes may exhibit extreme water level fluctuations due to water level management regimes associated with hydropower generation and may also have high turbidity. Lakes may experience a shift in algal composition to the ‘blue-green’ species typical of lakes that experience regular, nuisance algal blooms.

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Designated Use: Fish Consumption

Attainment: *No fish consumption advisories in effect.*

Non-attainment: *"Restricted Consumption" fish advisory or ban in effect during the reporting period for the general population or a subpopulation that could be at potentially greater risk (e.g., pregnant women, children).* Restricted consumption is defined as limits on the number of fish of one or more species consumed per unit time. The limit on number consumed often varies with fish size. All Maine lakes are considered to be in non-attainment of fish consumption due to mercury contamination from atmospheric sources.

Designated Use: Recreation In/On (swimming)

Attainment: *Lakes that do not exhibit regular, nuisance algal blooms during the summer (high use) period.*

Non-attainment: *Lakes in which swimming is chronically (more than 5 of the past ten years) impaired during part of the recreational season due to culturally induced nuisance algal blooms.* Bloom conditions are defined as Secchi Disk Transparency measurements of less than 2 meters in lakes having color less than 30 Standard Platinum Units (SPU). Lakes having color of 30 SPU or greater are considered impaired if other trophic data or professional judgment indicates that transparency is restricted due to high algal productivity and that the elevated productivity is due to anthropogenic alterations.

Designated Use: Drinking Water Supply (after disinfection/treatment)

Attainment: *Lakes for which information / data suggests that the water is suitable for drinking after reasonable treatment.*

Non-attainment: *Lakes designated as a water supply, for which information / data suggests that the water is no longer suitable for drinking with reasonable treatment using current technology.*

Attainment Status and Listing Categories

The 2004 Integrated Report presents the Maine DEP's evaluation of lake attainment status according to guidelines established for the 2002 Integrated Report. EPA established Listing Categories 1 through 5 in which lake waters are placed depending on the Department's confidence in whether the water is 'In Attainment' or is 'Impaired'. Lakes falling into Category 1 are lakes that 'Fully Attain All Designated Uses'. Category 5 lakes are at the opposite end of the spectrum or are in 'Non-attainment' (impaired) status and thus require the development of a TMDL. Lakes in Category 3 have insufficient data or information to make attainment determinations. Table 4-17 summarizes specific categories and subcategories used in the 2004 assessment of Maine lakes.

Table 4-17 Summary of Listing Categories and Subcategories used in the 2004 Assessment of Maine lakes.

Listing Category	Category Summary
1	Attaining all standards
2	Attaining some standards; assumed to attain others
3	Attaining some standards; Insufficient / no data / info to determine if standard(s) are met for use that may be impaired
4a	TMDL complete
4b	Expected to meet standards
4-b-3	Regional TMDL needed due to airborne Hg deposition
4c	Not impaired by a pollutant
5a	TMDL needed

It is important to recognize that the use of the term 'Threatened' has changed since the 2000 assessment. EPA guidelines issued in 2002 restricted use of this designation to waters expected to be in non-attainment by the next assessment cycle. In past assessments, the term 'Threatened' was applied to lakes predicted to have a change in trophic state over a 25-50 year period using water quality modeling, and/or to lakes from which data indicated that one algal bloom had occurred in the recent past. No lakes were listed as 'Threatened' in the 2002 assessment nor are any listed in the 2004. The term 'watch list' is used for a subset of Category 3 lakes for which additional data and time is needed to determine attainment status.

Category 1: Lake waters attaining all designated uses and water quality standards, and no use is threatened.

For the purposes of this assessment, lakes having no population in their direct watersheds have been listed in 'Category 1, Attaining all standards', with the exception of four lakes. Four of these exceptions are listed in category 4c, in non-attainment of the Aquatic Life Use (habitat) due to non-pollutant (hydrologic modification). Fitzgerald Pond, previously listed in Category 3 (2002), has recovered from a point-source discharge removal and is listed in Category 1 for 2004.

Direct watershed populations were determined using the 2000 Census data for Maine municipalities and a database containing the areas of various towns that occur in over 2,700 lake direct drainages. These 2,700 or so lakes are the largest, most significant lake waters in the state. Towns associated with the lake in Inland Fisheries and Wildlife's Lake Index were used to determine populations in direct watersheds of the remaining smaller lake waters (less likely to have watersheds spanning multiple towns). Since non-attainment of Class GPA focuses on lakes that deviate from natural conditions particularly, those induced by human activity, lakes having no population in their direct watershed have a very high degree of certainty of attaining all standards. The number of lakes listed in Category 1 is 2,855, totaling 285,573 acres. Of these, 1,017 (271,100 acres) are considered 'Significant' and 1,838 (14,473 acres) are not. Waters are combined to the 10 digit HUC (Hydrologic Unit Code) within which they are located (Appendix II, Category1). Lakes having population density estimates greater than 0.00 persons per square mile are listed in one of the other categories.

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Category 2: Lake waters attaining some of the designated use(s), no use is threatened, and insufficient data or no data and information is available to determine if the remaining uses are attained or threatened (with presumption that all uses are attained).

The Department is highly confident that these waters attain the following designated uses: drinking water (after disinfection / treatment), recreation in/on the water, fishing (excluding fish consumption), and as habitat for fish and other aquatic life. Category 2 contains 2,865 lakes or 568,990 lake acres. Of these, 1,235 (555,484 acres) are considered 'Significant' and 1,630 (13,506 acres) are not. Waters are combined to the 10 digit HUC within which they are located (Appendix II, Category 2).

The 'recreation in' (swimming) and 'aquatic life support' uses are functionally linked with the subsequent GPA requirement that lakes 'shall be free of culturally induced algal blooms'. Of this list, 'recreation in' would be one use for which some question might arise if it were not for a probability-based study the results of which suggest that most of the lakes in non-attainment due to nuisance algal blooms have been identified. Specifically, the REMAP (Regional Environmental Monitoring and Assessment Program) study results from the mid-1990s indicated that 4% of that lake sub-population (2.5% of the lake acreage) as being in non-attainment due to algal blooms. Those statistics can be used to evaluate how successful Maine's lake assessment program has been at identifying specific lakes that support nuisance algal blooms. Looking at current assessment information from the overall population from which the REMAP lakes were selected reveals that 25 of 1,903 lakes or 1.26% support nuisance blooms (30,253 of 926,092 acres or 3.27 % of lake surface area). The percentages compare quite closely to what one might expect given predictions based on the REMAP data results.

Category 3: Lake waters with insufficient data and information to determine if designated uses are attained (with presumption that one or more uses may be impaired).

There are currently 20 lakes covering 26,788 acres listed in Category 3 (Appendix II, Category 3) all of which are designated as 'Significant'. These lakes may or may not be in attainment of 'aquatic life' and/or 'recreation in'. The Department has data suggesting that these waters are meeting some designated uses criteria but has evidence that suggests the lakes are 'borderline' with respect to another use. These lakes are the highest priority for data collection over the next few years.

Sixteen lakes were removed from the Category 3 list since the 2002 assessment. Sewall Pond was moved to Category 5a (TMDL needed). Fifteen were moved to either Category 1 or Category 2 because new data revealed that all assessed uses were currently (or presumed to be) in attainment. Estes Lake was added to Category 3 from Category 4b because data suggests that it is in attainment of designated uses due to a treatment plant upgrade. Technically, it could be moved to Category 2, but the Department would like additional data to verify attainment.

Category 4: Lake waters that are impaired or threatened for one or more designated uses, but do not require development of a TMDL.

There are currently 19 lakes covering 86,936 acres listed in Category 4, all of which are designated as 'Significant'. These lakes fall into two subcategories: waters on which TMDLs have been completed (4a) and waters with impairments not caused by a pollutant (4c).

Category 4a contains 10 lakes totaling 21,104 acres. This represents the addition of 5 lakes for which TMDLs have been completed since the 2002 305(b) Report: Webber Pond, Threemile Pond, Threecornered Pond, Highland (Duck) Lake, and Mousam Lake. Completed TMDL documents for these waters are posted on the DEP website at the following URL: www.maine.gov/dep/blwq/docmonitoring/tmdl2.htm

Estes Lake (387 acres) was the only Category 4b lake in 2002. Recent data revealed that it does appear to meet designated uses, thus it has been moved to Category 3. Estes is one of the few lakes in Maine having a point-source discharge from a municipal wastewater treatment facility. The treatment plant was upgraded in the mid-1990s and since then, the frequency of nuisance algal blooms has decreased as the lake responds and equilibrates to the nutrient load reduction. Estes could have been moved to Category 2, but the Department would like additional data to verify continued attainment.

All Maine lakes are listed in Category 4-b-3, lakes impaired by atmospheric deposition of mercury resulting in a statewide fish consumption advisory (see discussion in listing Methodology section).

Nine lakes (65,832 acres) are listed in Category 4c, lake water impairment not caused by a pollutant. All of these lakes are in non-attainment of aquatic life (habitat) standards due to hydromodification (drawdown). Richardson Lake was moved to Category 2 since 2002 because a new water level has been established, the results of which should greatly reduce impacts on aquatic life and habitat.

Category 5: Lake waters that are impaired or threatened for one or more designated uses by a pollutant(s), TMDL development is required.

Four sub categories have been designated under Category 5, however lakes have been listed in only two. Category 5a includes 23 lakes (18,885 acres) all of which are designated as 'Significant' (lakes impaired by pollutants, and require a TMDL to be conducted by the State of Maine). These totals reflect the movement of 5 lakes to Category 4a and the addition of one lake, Sewell Pond, from Category 3. Appendix II, Category 5a lists these lakes, indicates target dates for TMDL completion and indicates development priority. Table 4-18 summarizes individual use support for lakes in Category 5a.

Table 4-18 Individual Use Support Summary for Lakes & Ponds (acres) in Category 5a (TMDL Needed)

Designated Use	Non-Attainment	Attainment
Drinking Water Supply (after disinfection/treatment)	0	18,885
Aquatic Life use Support	18,885	0
Fishing	0	18,885
Recreation In/On	12,338	6,547
Navigation, Hydropower, Agriculture & Industrial Supply	0	18,885

Causes or Stressors resulting in non-attainment and Sources are summarized for all impaired waters in Tables 4-7 and 4-11 in Section 4-3 of this document. Tables 4-8 and 4-12 present additional detail by listing Causes and Sources by Listing Category.

For more information on Lake TMDL projects:

Contact: Dave Halliwell, DEP BLWQ, Division of Environmental Assessment

Tel: (207) 287-2901 email: David.Halliwell@maine.gov

Related Website: www.maine.gov/dep/blwq/docmonitoring/tmdl2.htm

Information Formally Requested Under CWA Section 314

(and tables presented on corresponding pages of the 1997 305(b) guidelines)

Trophic Status of Significant Publicly Owned Lakes

Lakes can be classified in many ways. For example, they may be classified according to their depth, size, conductivity, hardness, or according to the type of fish assemblages they support. The classification of a lake according to its productivity is known as *trophic* classification. Trophic status can be directly related to water column nutrient levels, algal populations and the resulting transparency.

A lake is considered productive or ***eutrophic*** when nutrient levels are high enough to support high levels of algal growth. Conversely, an unproductive or ***oligotrophic*** lake is low in nutrients and thus does not support high algal populations. Algal populations interfere with the transparency of the water, so eutrophic lakes generally have lower transparencies than oligotrophic lakes. Lakes with intermediate levels of nutrients and algae are considered ***mesotrophic***. ***Hypereutrophic*** lakes are characterized by an overabundance of nutrients and may support nuisance algal blooms during most of the open-water season. Lakes having a color resembling weak tea are stained with humic acids and can also be classified as ***dystrophic***. In this report, many dystrophic lakes fall under one of the other classifications (eutrophic, mesotrophic or oligotrophic).

The Maine Department of Environmental Protection determines the trophic state of a lake by using a combination of Secchi Disk Transparency (SDT), Chlorophyll a (CHL a), Total Phosphorus concentrations and best professional judgement. When adequate data exists, Trophic State Indices (TSIs) calculated from each of the previously mentioned parameters will range from 1 to approximately 120. An overall TSI, calculated from the average of 2-3 parameter TSIs, provides the most reliable trophic estimate. Relatively few lakes, however, have enough data to allow this calculation. Table 4-19 illustrates how TSI values compare to trophic parameters in the determination of trophic state. Note: because no Maine lakes support nuisance algal blooms year round, hypereutrophic status is not included in this table.

Table 4-19* Lake Trophic State Parameters and Guidelines

Numerical Guidelines for Evaluation of Trophic Status in Maine			
(Note: Dystrophy is not often evaluated as a trophic category separately from categories below.)			
	Trophic Status		
Parameter[1]	**Oligotrophic**	**Mesotrophic[2]**	**Eutrophic**
SDT[3]	> 8 meters	4-8 meters	< 4 meters
CHL a	< 1.5 ppb	1.5 – 7 ppb	> 7 ppb
Total Phosphorus[3]	< 4.5 ppb	4.5 – 20 ppb	>20 ppb
TSI[3,4]	0-25	25-60	>60 and/or repeated algal blooms

[1] SDT, CHL a, and Total Phosphorus based on long-term means.
[2] No repeated nuisance algal blooms.
[3] If color is > 30 Standard Platinum Units (SPU) or not known, chlorophyll a concentration (CHL a), dissolved oxygen and best professional judgment used to assign trophic category.
[4] TSI = Trophic State Indices are calculated when adequate data exists and color is at or below 30 SPU.
* This table is a duplicate of Table 4-1 in the Assessment Methodology Section of this report (appears twice for the reader's convenience).

Section 314 requires a summary of trophic classification for Maine's 'Significant' lakes. This summary is compiled using the numerical criteria in Table 4. When little or no standard trophic data are available, a trophic assignment is made using the best professional judgement of Maine Department of Inland Fisheries and Wildlife (DIFW) fisheries biologists. DIFW trophic assignments are used with the understanding that they reflect the productivity of the whole ecosystem rather than just the water. Table 4-20 summarizes the trophic status of Maine lakes. Few lakes have been assigned to the "dystrophic" category; dystrophy is defined as color >50 Standard Platinum Units (SPU) due to humic acids, often accompanied by depressed dissolved oxygen levels, a definition not truly exclusive of other trophic categories. For example, Threecornered Pond in Augusta is classified in this report as eutrophic but could also be classified as dystrophic.

Table 4-20 Trophic Status of Maine Lakes

Trophic Category	Significant Lakes		All Lakes	
	Number	Acres	Number	Acres
Assessed	1,740	927,170	1,911	928,491
Dystrophic	2	34	2	34
Eutrophic	590	150,922	660	151,354
Mesotrophic	1,023	664,714	1,120	665,556
Oligotrophic	125	111,500	129	111,547
Unknown	574	32,023	3,871	58,681

Lake Rehabilitation Techniques

Section 314 of the Clean Water Act required states to present information related to Section 314 Phase I, II and III Lake Restoration Grants. Section 314 has not been funded for more than a decade thus no additional projects have been added to the list presented in the 2000 Water Quality Assessment Report. Some comparable projects have been implemented under the Section 319, Nonpoint Source Program, which addresses nonpoint sources in watersheds for all water types. However, no central system is in place to track specific techniques employed in lake watersheds using 319 funds. This information can be gleaned from the 319 final reports that are on file at the DEP office in Augusta, Maine (Contacts: Norm Marcotte or Tony St. Peter, (207) 287-3901) or on file with Sandy Fancieullo at EPA Region 1 headquarters in Boston, Massachusetts (617) 918-1566.

Lake watershed implementation projects conducted under the 319 program in Maine generally fall into one of three categories. Nonpoint source staff estimate that the majority (65-75%) of such projects are installation of Best Management Practices (BMPs) to address siltation and sedimentation associated with eroding sources along public and private roadways. Shoreline stabilization projects are the second most common types of BMPs implemented. Such BMP implementations primarily focus on mitigating the effects of stormwater runoff. An educational component is also often included in 319 projects since changing the behavior of people is most likely to provide long-term solutions for the prevention of nonpoint source pollution. Table 4-21 summarizes these techniques.

Table 4-21 Lake Rehabilitation Technique Summary (Section 319 Projects)

Rehabilitation Technique
Watershed Treatments BMPs associated with Public & Private Road Management BMPs associated with Shoreline Erosion Control/Bank Stabilization
Other Lake Protection/Restoration Controls Public Information/Education Program/Activities

Qualifying projects in non-attainment lake watersheds, either having a completed TMDL (Category 4a) or on the TMDL list (Category 5a) are given preference in the 319 grant selection process. Section 319 lake projects generally fall into one of three categories: Watershed Surveys, Watershed Management Plans or Watershed Implementation Projects. New in 2003/2004, is discussion regarding funding an in-lake evaluation of trophic stability in East Pond (Category 4a, TMDL completed in 2001) to investigate the possibility that a 'trophic cascade' has occurred that is contributing to the now persistent nuisance summer algal blooms. A biomanipulation project consisting of fish removal may be considered if results indicate an imbalance between trophic levels.

For more information on the East Pond Biomanipulation project,

Contact: Dave Halliwell, DEP BLWQ, Division of Environmental Assessment

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or Melissa Evers, DEP BLWQ, Division of Environmental Assessment

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Acid Effects on Lakes

Although all monitored Maine surface waters are inferred to have elevated non-marine sulfate concentrations resulting from acidic deposition over the past 50 to 100 years, only a portion of known acidic lakes can be considered as having been predominantly affected by atmospheric deposition. Since the late 1970s, the effects of acidic deposition have been the focus of numerous projects conducted by EPA, DEP and the University of Maine. The 1984 EPA Eastern Lake Survey (ELS) population (225 lakes) was chosen such that statistical inferences about the extent of acidic deposition effects could be made for lakes throughout the state. ELS projected that between 8 and 21 Great Ponds were acidic in the State of Maine. Estimates place the number of non-dystrophic Maine lakes which are currently acidic (Acid Neutralizing Capacity or ANC < 0 microequivalents/L) at around 100.

Researchers at the University of Maine have evaluated lake populations potentially susceptible to the effects of acidic precipitation in conjunction with DEP. Approximately 90 high elevation lakes in chemically resistant bedrock were assessed in the High Elevation Lakes Monitoring (HELM) projects during 1986-1987 and 1997-2003. A population of 150 seepage lakes in or associated with mapped aquifers was assessed in the Aquifer Lakes Pilot Survey (ALPS) projects during 1986-1987 and 1998-2002. Data have also been collected quarterly since 1982 from the EPA Regional Long Term Monitoring (RLTM) sites in Maine. Additional data also exist from numerous University of Maine projects. In addition, the DEP has evaluated alkalinity data on 761 lakes as part of routine sampling to assess trophic status. The Department has not made any effort to enumerate lakes vulnerable to acidity other than focusing the HELM and ALPS studies on lake populations at high risk. It is likely; however, that all lakes situated in areas of bedrock and surficial geology having low to no acid neutralizing capacity would be categorized as being vulnerable to acidity.

Approximately 1,150 lakes (797,000 acres - approximately 80% of lake surface area) have been assessed for acidity, predominantly by using measures of pH and ANC. There are about 65 acidic lakes (ANC < 0) comprising a total surface area of approximately 750 acres (1.0% of the lakes and 0.08% of the lake surface area). Approximately 20 of the roughly 65 acidic lakes are ten acres or greater in size and considered 'significant'; the remainder are at least 1 acre in size. Extrapolation of Eastern Lake Survey results predicts that there are probably only a few unidentified acidic lakes greater than ten acres in size. There are likely some (probably less than 50) additional non-dystrophic acidic drainage and seepage lakes in the 1 to 10 acre size range. Table 4-22 provides a summary of acidity assessment efforts in Maine lakes.

Table 4-22 Acid Effects on Maine Lakes*

	Number of Lakes	Acreage of Lakes	%Acreage
Assessed for Acidity	~1,150	~797,000	~80%
Impacted by High Acidity	~65	~750	~0.08%
Vulnerable to Acidity	Unknown	Unknown	Unknown

*Totals include all lakes in the state, not only 'significant' lakes

Sources of acidity include acidic deposition, naturally occurring organic acids and a combination thereof, as determined by an assessment of dissolved organic carbon (DOC) and non-marine sulfate concentrations. Acidic low-DOC (< 5 mg/L) drainage and seepage lakes are acidic largely due to acidic deposition. Acidic high-DOC

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drainage lakes are acidic due to a combination of naturally occurring organic acids and acidic deposition. Acidic high-DOC seepage lakes are acidic primarily due to naturally occurring organic acids. No low-DOC lakes are known to have a pH less than 4.9; this suggests that organic acidity is necessary to depress pH to values less than 5.0. Table 4-23 summarizes source estimates for high acidity in Maine lakes.

Table 4-23 General Sources of Acidity in Acidic Maine Lakes

Source of Acidity	Percent of Acidic Lakes	Percent of All Maine Lakes*
Acid Deposition	60%	0.62%
Natural Sources	30%	0.31%
Combination of Acid Deposition & Natural Sources	10%	0.1%
Total	**100%**	**1.3%**

* Includes all lakes in the state, not only 'significant' lakes

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Historical data on fisheries are limited for all but a handful of the acidic lakes. Temporal shifts in fish populations have been observed in some lakes, but there is no clear association between these shifts and acidic deposition. Although a number of these acidic lakes are fishless, none have been shown to have lost their fish due to acidification. Thus all are considered to be fully supporting their designated uses. However, it should be noted that many of the fishless lakes are small and isolated, or exist at high elevations and contain poor breeding habitat.

The extent of aluminum mobilization due to increased acidity is dependent on the presence or absence of substances which bind aluminum such as DOC and fluorine. Greatest aluminum toxicity has been observed between a pH of 5 and 6; however only a few of the numerous ionic species are biologically toxic. Table 4-24 presents the general distribution of lakes among four ranges of aluminum concentration. No consideration is given to the form of aluminum, thus a significantly lesser amount would be considered biologically available. Since 40% of the acidic lakes have high levels of DOC, it can be inferred that biologically available aluminum is less likely to attain toxic levels in those lakes. Recent data from long term studies (HELM and RLTM) indicate that toxic aluminum concentrations have decreased in some of these lakes.

Table 4-24 Aluminum Distribution in Acidic Lakes in Maine

Total Aluminum (ug/l)	Approximate Percent Acidic Lakes
< 100	~ 67 %
100 – 200	~ 7 %
200 – 300	~ 9 %
> 300	~ 17 %

No attempt has been made to mitigate the effects of acidic deposition or potential toxic mobilization in lakes for the following reasons:

1) only a small percentage of surface water has been acidified by acidic deposition,

2) lakes affected by acidic deposition are typically small in surface area,

3) paleolimnological evidence suggests that those lakes with depressed pH attributable to acidic deposition were historically low in pH (and Ca) as a result of inherent watershed characteristics,

4) no alteration of fish populations in lakes can be attributed to acidic deposition at this time, and

5) since a significant number of the acidic lakes are dominated by organic acidity, alteration of the buffering system (e.g., by the addition of lime) would drastically change the natural ecosystem.

Evaluation of long-term pollution reductions reveals that sulfate concentrations in Maine lakes have declined by 12-22% since 1982. It was expected that trends in acidity would exhibit a parallel reduction however, the data reveal otherwise. A simultaneous decline in base cation concentration (calcium and magnesium, important for reduction in acidity) accounts for the lack of recovery. A number of interacting factors may be influencing the latter including continued high levels of nitrogen deposition, a lag in response time, and/or climatic influences on watershed response.

The Senator George C. Mitchell Center for Environmental and Watershed Research at the University of Maine, Orono, continues to be the leader in atmospheric deposition research in Maine. Researchers at the Center are currently studying a set of lakes from Maine to Pennsylvania, first sampled by the U.S. Environmental Protection Agency (EPA) in 1984, to evaluate 20-year changes in lake chemistry for the purposes of understanding changes due to acid rain, and potential recovery in biological populations. Additional information on related research can be obtained through their website, located at the following URL: www.umaine.edu/WaterResearch

Toxics

Contact: Barry Mower, DEP BLWQ, Division of Environmental Assessment

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Related Website: www.maine.gov/dhs/ehu/fish/

Fish, water and sediment samples were collected from 125 Maine lakes and ponds (108,423 acres) in 1993 and 1994 as part of the EPA funded Regional Environmental Monitoring and Assessment Program (REMAP). The study lakes were selected from a population of about 1,800 surveyed lakes and ponds with significant sport fisheries using EPA's National EMAP (Environmental Monitoring and Assessment Program) protocol. Significant levels of mercury were found in both warm and cold water fish. The average concentration was 0.45 ppm. Fish from several lakes exceeded the 1994 Federal action level of 1.0 ppm and 65% of the lakes yielded fish that exceeded the 1994 State action level of 0.43 ppm. Since that time, Maine's level of concern has since been reduced from 0.43 ppm to 0.2 ppm.

In 1994, the Maine Department of Human Service's Bureau of Health issued Maine's first mercury advisory. Further refinements were made to the advisory in 1997 and again in 2000. The advisory currently says:

"Warning: Mercury in Maine freshwater fish may harm the babies of pregnant and nursing mothers, and young children. Pregnant and nursing women, women who may get pregnant and children under age 8 SHOULD NOT EAT any freshwater fish from Maine's inland waters. Except, for brook trout and landlocked salmon, 1 meal per month is safe. All other adults and children older than 8 CAN EAT 2 freshwater fish meals per month. For brook trout and landlocked salmon, the limit is 1 meal per week."

Trends In Lakes

In the past, statistical trend analysis has been conducted using a long-term transparency dataset that DEP has actively acquired and administered since 1970. Data had been analyzed using the non-parametric Kendall-Tau test in SYSTAT. This analysis has not been repeated since the 2000 assessment because of the elimination of one lake assessment staff position at DEP.

Some general insight into water quality that has been gained in recent years is likely due to the drought that Maine has been experiencing. Many lakes have achieved the deepest transparency readings ever. In 2003, 64% of lakes monitored by DEP and volunteers in the Maine Volunteer Lake Monitoring Program had an average transparency greater than their long term average, 14% had an average transparency the same as their long term average, and only 21% had an average transparency less than their long term average. Lakes with better transparencies are likely to be those most sensitive to phosphorus inputs due to stormwater runoff. Lakes with worse transparencies appear to be those that already have high internal phosphorus loads. Additional information on recent lake transparency trends may be found in the Maine Volunteer Lake Monitoring Program's (VLMP) 2003 and 2002 Annual Reports. VLMP annual reports may be accessed through the "Publications" link on their website at this URL: www.mainevolunteerlakemonitors.org/index2.htm

Invasive Aquatic Plants

Contact: John McPhedran, DEP BLWQ, Division of Environmental Assessment

Tel: (207) 287-6110 email: John.McPhedran@maine.gov or Milfoil@maine.gov

Related Website: www.maine.gov/dep/blwq/topic/invasives/index.htm

Invasive aquatic plants are cited by lake biologists as one of today's leading threats to the quality of New England's inland surface waters. This problem also translates into social and economic burdens associated with lost recreation, degraded real estate values and escalating vegetation "control" costs. These "control" costs amount to millions of dollars spent in Maine's neighboring states that collectively face at least five established, aggressive, nuisance plant species.

The mission of the DEP Invasive Species Program is to reduce risks of introduction and further spread of these species in Maine's 6,000-plus ponds and lakes. Now entering the third year of these efforts, the program has sustained a high degree of public awareness of this issue and continues to enlist significant numbers of volunteer efforts to monitor lakes, inspect boats and offer local outreach.

Two legislative mandates charge the Maine DEP in this program area: "An Act to Prevent the Spread of Invasive Aquatic Plants" (Chapter 722) and "An Act to Prevent Infestation of Invasive Aquatic Plants and to Control Other Invasive Species" (Chapter 434).

Chapter 722, enacted in 2000, prohibits the transport of 11 invasive aquatic plants and entrusts the DEP with education / outreach efforts and authorizes staff to investigate and document detection of invasive plants and control their spread, if feasible.

Chapter 434 was enacted the following year and provided more sweeping authorities while stipulating additional program and planning requirements. Among these requirements are

- a boat sticker program to raise funds and public awareness for the prevention, detection and control of invasive species;
- an inspection and education program; and
- emergency authority to regulate surface use in plant-infested waters

In addition, the law directed the governor to appoint an interagency task force on invasive aquatic plants and nuisance species to oversee efforts and offer recommendations for comprehensive planning and management of all invasive aquatic plants and nuisance species in the state.

As of this writing, Maine is contending with two invasive aquatic plants - variable-leaf water milfoil (Myriophyllum hetrophyllum) and hydrilla (Hydrilla verticillata). In 2003 one previously undocumented pond, Shagg Pond in Woodstock, was added to a list of 15 ponds or lakes infested with variable milfoil. Only one pond, Pickerel Pond in Limerick, is known to contain hydrilla. A detection of a third invasive species, curly-leaved pondweed (Potamogeton crispus), was reported in West Pond, Parsonfield, during mid summer 2003; however, the degree of its establishment cannot be determined until the spring of 2004.

Dedicated monies from the aforementioned Boat Sticker Program fund were applied in 2002 and 2003 as indicated by the following charts:

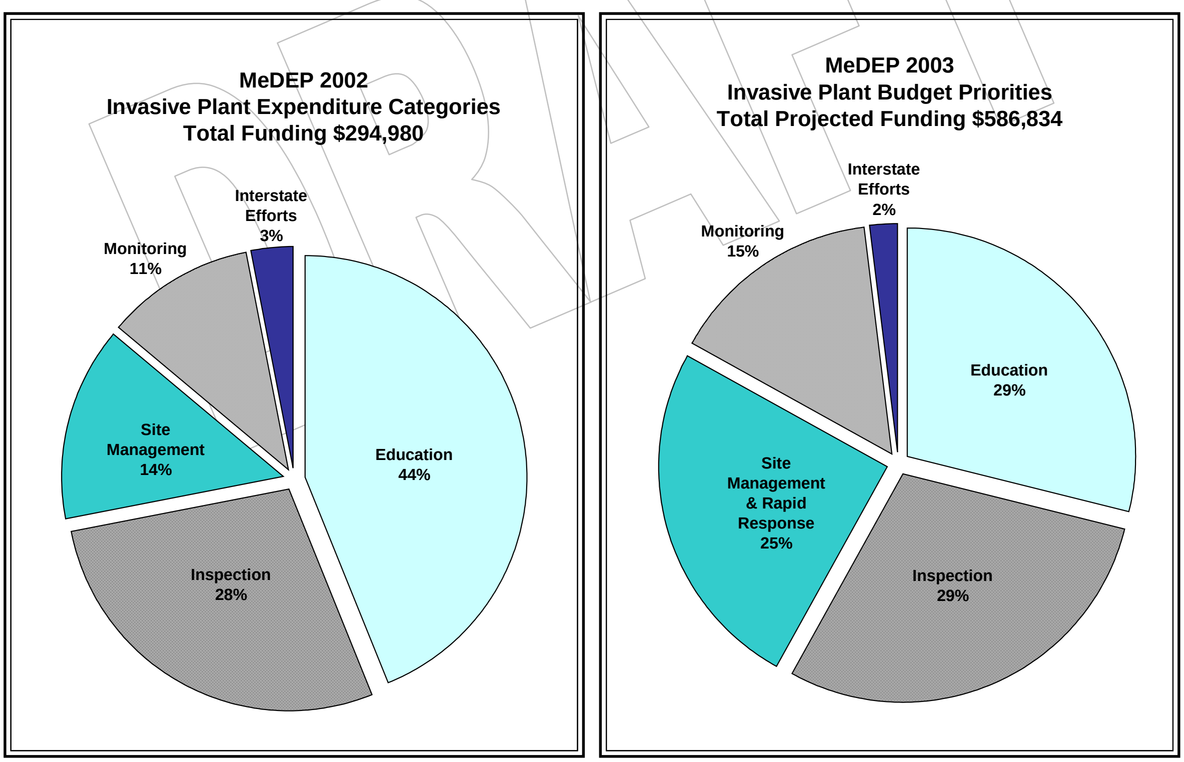

Figure 4-5 Invasive Plant Program - 2002 and 2003 Budget Expenditures & Priorities.

The Invasive Species Program continues to meet the needs outlined above, while addressing new issues. Among them are increased requests from residents and users of lakes seeking assistance in managing established invasive plant problems. While providing increased support to respond to these requests, it is incumbent upon DEP to also apply proportionately greater resources to prevent plant invasions--an option far more cost effective in the long term than mitigating established invasions.

Section 4-6 ESTUARIES / OCEAN

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Background

Maine has three classes for the management of estuarine and marine waters: SA, SB, and SC. SA waters are managed for high water quality with limited human interference allowed. No direct discharges of pollutants, including those from finfish aquaculture, are allowed in SA waters. SB waters are general-purpose waters and are managed to attain good quality water. Well-treated discharges of pollutants that have ample dilution are allowed. SC waters are managed for the lowest water quality, but they must be fishable and swimmable as well as maintain the structure and function of the biological community. Well-treated discharges of pollutants are allowed in SC waters. Each class is managed for designated uses and each has dissolved oxygen, bacteria and aquatic life standards (see Table 4-25 below).

Table 4-25 Maine's Estuarine and Coastal Waters Classification Standards

Class	Designated Use	Dissolved Oxygen	Bacteria	Aquatic Life
SA	Habitat for fish and estuarine and marine life Recreation in and on the water Fishing Aquaculture (not finfish) Propagation and harvesting shellfish Navigation	As naturally occurs	As naturally occurs	As naturally occurs
SB	Habitat for fish and estuarine and marine life Recreation in and on the water Fishing Aquaculture Propagation and harvesting shellfish Navigation Industrial process and cooling water supply Hydroelectric power generation	Not less than 85% of saturation	Enterococcus not higher than geometric mean 8/100ml or instantaneous of 54/100ml from 5/15 to 9/30 Not exceed criteria of National Shellfish Sanitation Program for shellfish harvesting	Support all indigenous estuarine and marine species Discharge not to cause closure of shellfish beds
SC	Habitat for fish and estuarine and marine life Recreation in and on the water Fishing Aquaculture Propagation and restricted shellfish harvesting Navigation Industrial process and cooling water supply Hydroelectric power generation	Not less than 70% of saturation	Enterococcus not higher than geometric mean 14/100ml or instantaneous of 94/100ml from 5/15 to 9/30 Not exceed criteria of National Shellfish Sanitation Program for restricted shellfish harvesting	Maintain structure and function of the resident biological community

The areal distribution of the three marine classes is shown in Table 4-26 and Figure 4-6 below:

Table 4-26 Acres and Percentage of Marine and Estuarine Waters in Each Classification

Class	Acres	Percentage
SA	135,006.07	7.41 %
SB	1,668,011.47	91.58 %
SC	18,416.71	1.01 %
Total	1,821,434.24	100.00 %

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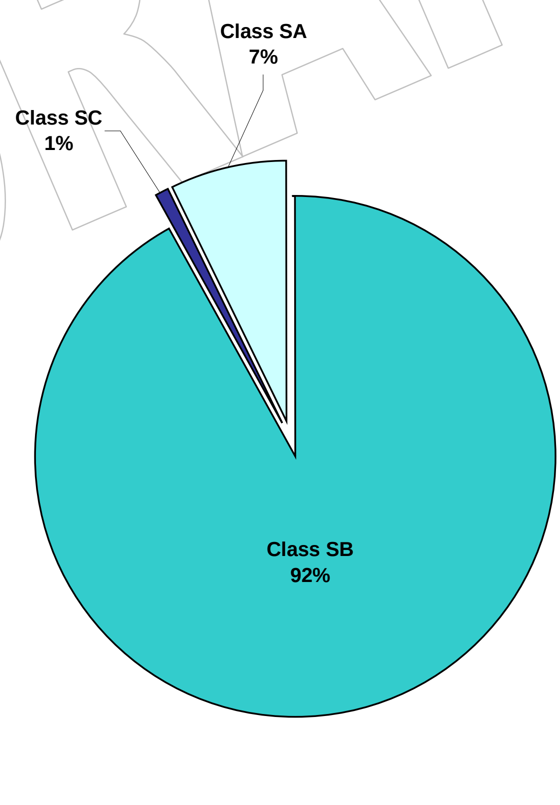

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Figure 4-6 Percentage of Estuarine and Marine Waters in Each Classification

This chapter provides an assessment of the degree to which water quality supports the designated use defined by the State of Maine Statutes for the protection of aquatic life. Designated uses in this chapter and in Chapter 7 (Public Health – Related Assessments) are divided into two broad use categories: protection of human health and protection of aquatic life. The protection of these uses will result in the protection of other uses (e.g. navigation, industrial process and cooling supply). Applicable monitoring results and attainment assessments are summarized within each of these two categories in this chapter as well as in Chapter 7.

Summary of Statewide Status

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This Integrated Assessment report requires the assignment of each Assessment Unit into one of five categories (see Methodology). A water is determined to be impaired if it does not attain one or more of the uses assigned by its classification as determined by the criteria assigned to the classification. Overall use attainment summary is provided in Table 4-5.

Category 1: The 2004 assessment assigned 2,660 (93.5 %) square miles of estuarine and marine waters to Category 1 (fully attaining*). This is an increase of 405.3 square miles from the 2002 assessment. The Department has determined through monitoring and evaluation, that large areas of marine and estuarine waters have few permanent impairments.

Category 2: The 2004 assessment assigned 92.4 (3.2 %) square miles of estuarine and marine waters to Category 2 (fully attaining*). This is an increase of 111 segments from the 2002 assessment. Most of these segments were moved from Category 3 (Insufficient Data to make a determination) and are areas that pass DMR's water quality tests but remain closed because of the presence of OBDs, sewage treatement plant outfalls, boats, presumed toxic contamination, potential sources of NPS pollution, etc.

Category 3: The 2004 assessment assigned 4.8 (0.2%) square miles of estuarine and marine waters to Category 3 (attainment undetermined*). This is a decrease of 183 segments from the 2002 assessment. For the 2004 report, DMR provided DEP with the data to determine if the designated uses were being attained in most cases. Almost all of the segments were moved to either Category 2 or Category 5-B.

Category 4: The 2004 assessment assigned 17.8 (0.6%) square miles of estuarine and marine waters to Category 4 (impaired for one or more uses*). This is an increase of one square mile (1 segment) from the 2002 assessment. This segment was listed in Category 5A in the 2002 report. The municipal point source has been removed and data are being collected to assess attainment. For the 2004 listing, Maine has assigned all waters affected only by Combined Sewer Overflows (CSO) to Sub-category 4-B-2. See the discussion in Listing Methodology section of this report (waters impaired by CSOs are also listed in other categories). CSO-impaired waters were previously listed in the 2002 report in Sub-category 5-B-2. For the 2004 listing, Maine has also assigned all waters affected by atmospheric mercury, PCBs, and dioxin deposition to 4-B-3. See the discussion in Listing Methodology section of this report (waters impaired by mercury consumption advisories are also listed in other categories*). Mercury-impaired waters were previously listed in the 2002 report in Sub-category 5-C.

* All estuarine and marine waters in Maine have an advisory for the consumption of fish and shellfish (lobster tomalley) due to the presence of mercury, PCBs and dioxins presumed to be from atmospheric deposition. The advisory is based on probability data that fish or shellfish inhabiting estuarine or marine waters may contain some fish or shellfish that exceed the advisory action level. This Integrated Water Quality Monitoring and Assessment Report does not consider this statewide advisory in establishing other category listings.

Category 5: The 2004 assessment assigned 70.7 (2.5%) square miles of estuarine or marine waters to Category 5 (impaired for one or more uses*). This is net increase of 67.5 square miles (107 segments) in Category 5-B and a decrease of one square mile (1 segment) from the 2002 assessment (see Category 4 above). Category 5 impaired waters require the development of a Total Maximum Daily Load (TMDL) determination. Waters are placed in one of three subcategories: 5-A for waters impaired by pollutants, 5-B for waters impaired only by bacteria, 5-D for waters impaired by the residuals of “legacy” activities.

As with any assessment of this kind, the identification of impaired waters cannot be considered complete but rather is a reflection of the findings to date relative to the level of effort expended by the agency and other cooperating contributors. While new and expanded monitoring has identified many additional square miles of impaired waters this should not be interpreted as an indication that Maine’s waters are under some new or increasing threat. Rather, the State has been better able to assess its waters with improved monitoring tools and increased participation from cooperators. All of the new impaired listings appear to be due to conditions that have probably been in place for many years.

Causes and Sources of Impairment in Categories 4 and 5

Cause and stress type information is provided in Table 4-9, while information on sources of impairment are provided in Table 4-13.

The greatest impaired area (67.5 square miles) of estuarine/marine waters is due to baterial contamination. The second largest cause/stressor is toxics with dioxins, pesticides and PCBs accounting for most of those impaired miles (see section on Toxics later in this Estuarine and Marine Waters section). There has been no appreciable change in the impaired mileage assigned to each general cause.

Industrial point sources are the largest contributing source category. Some industrial loads that are treated through municipal point sources are additional sources although pretreatment is required in most cases. These industrial sources account for all of the shellfish (lobster tomalley) consumption listed waters where dioxins are the primary contaminant.

Sources of Monitoring Data

The Maine Department of Environmental Protection (DEP), the National Coastal Assessment/University of Southern Maine, the Department of Marine Resources (DMR), the Casco Bay Estuary Project (CBEP), the Wells Estuarine Research Preserve and a variety of volunteer monitoring groups monitor Maine’s coastal waters.

DMR monitors for indicators of human pathogens (e.g., fecal coliforms) and biotoxins (e.g., Paralytic Shellfish Poisoning). The purpose of DMR monitoring is to protect human health by managing shellfish harvest areas (see Chapter 7 of this report). DMR runs a Shellfish Sanitation Program Water Quality Volunteers program that is specifically focused on shellfish growing areas.

DEP monitors toxic contaminants in tissues and assesses water quality using data collected by DEP and other organizations. DEP also participates in the Gulf of Maine Council's Gulfwatch Project that surveys toxic contamination in mussel tissue in the Gulf of Maine.

The Maine State Planning Office, the University of Maine Cooperative Extension, Sea Grant, DMR and DEP collaborate in the Maine Shore Stewards Program to provide training, community support, information, grants and education for volunteer groups. The University of Maine Cooperative Extension/Sea Grant coordinates the Maine Healthy Beaches Program (see Chapter 7 of this report), the Clean Water/Partners in Monitoring program, and the Marine Phytoplankton Monitoring Program.

The Casco Bay Estuary Project (CBEP), funded by EPA's National Estuary Program, monitors and also supports other monitoring efforts in the Bay, through Friends of Casco Bay (FOCB) and other entities and coordinates the National Coastal Assessment for the entire Maine coast.

The GoMOOS (Gulf of Maine Ocean Observation System) program provides data on the gulf that is collected from buoys, satellites and radar; however, since all the buoys are located in offshore waters (with the possible exception of a future buoy to be located in the New Meadows River Estuary), they only monitor that ocean environment. DEP would advocate the placement of some new buoys closer to land in order to better monitor and understand nearshore waters and land/water interactions.

Results from these various monitoring sources provide the basis for determining attainment of classification and designated uses. One of the biggest challenges ahead is to get all the data that is collected into a central location and into useable, universally-translatable formats.

National Coastal Assessment (Probability-Based Monitoring)

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Related Website: www.epa.gov/emap/nca/

The purpose of the National Coastal Assessment (NCA) is to estimate the current status of the condition of the nation's coastal resources on a regional and national basis using ecological indicators. The partnership between EPA and Maine in the National Coastal Assessment may help Maine determine:

- the attainment status of all coastal Assessment Units for 305(b) reporting;
- the appropriate biocriteria metrics to support the water quality standards described in Maine's revised Water Classification law (38 MRSA, Section 465-B) of July 2001;
- the estimated area of degraded conditions because of toxic contamination in Maine's coastal waters;
- the toxics of concern; and

- if the "triad" (benthic animals, amphipod bioassay and sediment contamination) approach for assessing toxics is useful to Maine.

The National Coastal Assessment, Northeast Coastal Condition is based on data from samples taken from July through September of 2000 for coastal states from Maine to Virginia. The U.S. Environmental Protection Agency's (EPA) assessment estimates that ecological conditions in the Northeast are poor, with 25% of estuarine area being rated as impaired for aquatic life (poor condition) and 32% as impaired for human use. The Northeast is the most densely populated coastal region of the United States and includes the coastal waters from Maine to Virginia. However, Maine is the least densely populated coastal region of these states.

The Northeast contains diverse landscapes, from the mountains, forests and rocky coastal headlands of Maine to the coastal plain systems of the Mid-Atlantic. These differences are important when considering management options (i.e., one size does not fit all, especially north of Cape Elizabeth, Maine). In the Northeast, the ratio of watershed drainage area to estuary water area is relatively small when compared to the Southeast and Gulf of Mexico. The byproducts of past and current human activities in northeastern watersheds are washed to the sea, affecting coastal conditions in the region, including Maine. The old phrase, “dilution is the solution to pollution” does not work with toxic pollutants. The highest levels of sediment contamination are found in depositional environments near urban centers (e.g., Portland and Rockland Maine, Portsmouth New Hampshire), reflecting current discharges and the legacy of past industrial practices “dirty history” (e.g., the Dirty History study of the Fore River funded by the Casco Bay Estuary Project). These pollutants build up in sediments, get reworked by animals that live in the sediments and eventually get buried unless they are re-exposed (e.g., by dredging, dragging, etc.).

Excess nutrients delivered to coastal waters come from a variety of sources. In New England, nutrient inputs from land based agricultural activity is relatively small. Much of the nutrient delivery to the coast in the non-urban areas of northern Maine results from atmospheric deposition onto watersheds. The Casco Bay Estuary Project assessed atmospheric deposition, as it relates to nitrogen, mercury and fine particulate matter in Casco Bay, by collecting samples at a site in Freeport, Maine. For more information, please link to the following URL:

www.cascobay.usm.maine.edu/toxics.html#Air%20Deposition

According to the National Coastal Assessment, in urbanized coastal settings, from Casco Bay, Maine to Long Island Sound, wastewater treatment facilities that discharge directly into coastal waters are a major source of anthropogenic nitrogen input. In “Downeast” Maine, finfish aquaculture is a major source of nitrogen input, but the impact of these nutrients is undetermined at this time. Much of the impact depends on physical/oceanographic conditions such as tides, currents (e.g., the Maine Coastal Current), winds (especially the prevailing summer winds), temperature (i.e., stratification or layering of the water column in the warmer months), input of nitrogen from the Gulf of Maine and further offshore, tidal restrictions, and riverine sources, especially during snowmelt and after major runoff events.

The National Coastal Assessment is based on an average of five separate scores for: eutrophication, wetlands loss, sediment condition, benthic condition and contaminants in fish (when measured). Of course, the data for Maine are combined with data in areas that are much more degraded. In the future, when enough data are available, Maine will be assessed separately.

The National Coastal Assessment is based on a probability-based, stratified sampling design. This means stations were selected randomly to represent strata (regions) of similar characteristics e.g., Casco Bay, Long Island Sound, etc. Conclusions based on data from such programs are statistically valid for the strata, but are not necessarily representative of conditions at a particular station. Also, stations were sampled once in 2000 during the summer index period. Since water column conditions change constantly, the sampling only reflects a single snapshot of a three-month index sampling period. Another weakness in sediment sampling is the lack of replication. As is often the case, the cost often limits the amount of replication that is possible to undertake.

Due to the fact that there is little existing data for much of Maine’s waters, early in 2000, the State of Maine requested that some bays (Casco, Penobscot, Blue Hill and Cobscook Bays) have a greater level of sampling intensity than others. During 2000 and 2001, the entire coast was monitored. However, this experience proved that attempting to monitor the entire coast of Maine, logistically, turned out to be a very difficult task. So, Maine’s long coast was divided into three regions. Approximately 50 stations along the coast of Maine are sampled between early July and mid-September on a rotating schedule. The first year (2002) “Downeast” areas were sampled with an emphasis on Blue Hill Bay and a lesser emphasis on Cobscook Bay. The second year (2003) the mid-coast was sampled with an emphasis on Penobscot Bay and the third year (2004) southern Maine will be sampled with an emphasis on Casco Bay. This sampling scheme will provide more extensive information on Maine’s larger systems, while still allowing for a statewide assessment to be made at the end of the three-year sampling period. The information obtained from the intensively sampled systems will provide a baseline against which future impacts can be measured.

The National Coastal Assessment will provide complementary information on toxic contamination to Maine’s on-going toxics monitoring programs in Casco Bay and along the entire coast. Maine's Surface Water Ambient Toxics Monitoring Program (SWAT) has monitored toxic contaminants in mussels, lobster tomalley and meat and cormorant blood and feathers. The Gulfwatch Monitoring Program for the Gulf of Maine Council also monitors toxics in mussels along the Maine coast. The Casco Bay Estuary Project monitors toxics in mussels, sediment and lobster tomalley and meat. Sediments sampled by the Casco Bay Estuary Project in 2000, 2001, 2002 are being analyzed through a contract with Texas A&M. The results will be compared to samples taken in 1991 and 1994 by CBEP. Also, the recent samples will be compared to the National Coastal Assessment results for sediment contamination and sediment toxicity.

The “core” indicators monitored for the National Coastal Assessment are included in Table 4-27:

Table 4-27 Core Indicators for the National Coastal Assessment

Water Quality	Sediment Quality	Biota
Dissolved oxygen	Grain size	Benthic community structure
Salinity, temperature, depth, light attenuation, pH	Total organic carbon	Lobster meat and tomalley tissue analysis (starting 2004)

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Nutrients	Benthic Community Structure	
Chlorophyll	Sediment toxicity	

These indicators will be measured using methods developed by EMAP during the past 10 years. The protocols for sampling are described in the following documents:

The Coastal 2000 Field Operations Manual, Northeast Component www.epa.gov/emap/nca/html/docs/c2knefm.html prepared by Charles J. Strobel of the Atlantic Ecology Division, U.S. EPA, Narragansett, RI

The National Coastal Assessment Field Manual www.epa.gov/emap/nca/html/docs/c2kfm.html

The National Costal Assessment Coastal 2000, Quality Assurance Project Plan – 2000 www.epa.gov/emap/nca/html/docs/qaprojplan.htm

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GoMOOS (Fixed-Station Monitoring)

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Related Websites: (State-specific) www.gomoos.org (National) www.ocean.us

In 2001, GoMOOS deployed the first ten buoys to track the following types of information above and below the ocean surface.

- Measurements at the surface include wind, waves, temperature, and fog.
- GoMOOS provides hourly measurements of currents, temperature, salinity, color, turbidity, dissolved oxygen, and more.
- Satellites produce images showing ocean temperature, color and surface winds. These images help to fill information gaps that exist between buoys.
- CODAR (Coastal Ocean Dynamics Application Radar) is a new system of land-based stations that will use radio waves to produce hourly maps of ocean currents throughout the Gulf of Maine.

The Maine Department of Environmental Protection (DEP) is not on the GoMOOS Board and has not been very active in the discussions about the placement of buoys, the parameters monitored and the way that data are handled or communicated. However, the Maine State Planning Office and the Maine Department of Marine Resources are dues paying members of the Board and are able to provide feedback on issues of importance to the state in general and their agencies in particular.

This is an extremely beneficial program, both nationally and internationally, and has the goal of forecasting marine conditions, monitoring in real-time and providing a distributed database. The Maine Department of Environmental Protection and the Casco Bay Estuary Project (CBEP) should be invited to be more active participants in the GoMOOS program. Much greater communication is needed at the local level in order to maximize the potential benefits of this important program, the DEP believes that the inclusion of itself, along with a few other organizations into GoMOOS would be a great first step towards opening up these crucial, local lines of communication.

Casco Bay Estuary Project

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The Casco Bay Estuary Project work focuses in five priority areas: habitat protection, toxic pollution, stewardship, clam flat and swimming beach health, and stormwater pollution. Two water quality projects are highlighted.

Presumpscot River Management Plan: Stakeholders Plan the Future of a Recovering River

In 2000, the Casco Bay Estuary Project (CBEP) convened a diverse group of stakeholders to develop a management plan for the Presumpscot River. At that time, major changes were taking place (i.e., the removal of the lowest dam on the river and the cessation of pulp mill discharges) and the river began making a dramatic recovery. The need for a management plan to address both the new opportunities and

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environmental challenges that resulted was apparent. For three and a half years, CBEP facilitated and funded technical support for the stakeholder group to develop the scientific foundation that formed the foundation of a management plan titled; *A Plan for the Future of the Presumpscot River.* The plan, which focuses on three areas: fisheries, open space, and cumulative impacts, was finalized in the fall of 2003 and a new coalition, the Presumpscot River Watershed Coalition (PRWC), which grew out of the original planning committee has already begun to implement the plan.

Casco Bay Interlocal Stormwater Working Group: A Case Study in Regionalism

The Casco Bay Estuary Project (CBEP), in partnership with the Cumberland County Soil and Water Conservation District (CCSWCD) and Cumberland County Emergency Management Agency (CCEMA), facilitated the regional collaboration of eleven municipalities facing new stormwater regulations in the Casco Bay watershed (Portland, South Portland, Falmouth, Yarmouth, Freeport, Windham, Westbrook, Cape Elizabeth, Gorham, Scarborough, and Cumberland). The communities signed an interlocal agreement and have developed a regional plan to manage stormwater runoff. This interlocal group, the Casco Bay Interlocal Stormwater Working Group, has formed a strong working relationship and is now working together on a statewide stormwater education campaign as well as other aspects of their plan to reduce stormwater pollution.

Coastal Nonpoint Source Priority Watersheds

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One approach the State of Maine is using to attain or maintain water quality standards is through designating nonpoint source priority watersheds for preferential treatment by state agencies. Two programs, the 319 program and the Shore Stewards Program, award grants based on the priority watersheds, Salmon River Watersheds (see below) and those waters scheduled for a TMDL (Total Maximum Daily Load) analysis. Listed waterbodies have both significant value from a regional or statewide perspective, and water quality that is either impaired, or threatened to some degree due to nonpoint source water pollution from land use activities in the watershed. Table 4-28 gives the water quality problem or threat as was determined by a Maine Watershed Management Committee in the early 1990's. While Table 4-29 lists salmon river watersheds that are given a priority and/or special treatment with regard to projects condcuted within their boundaries. Volunteer monitoring groups have formed in many of these watersheds to monitor and assess the condition of these estuaries (see the following Case Study on the New Meadows River Estuary Project).

Table 4-28 Priority Coastal Waters with Threatened or Impaired Water Quality from Nonpoint Source Pollution*

Coastal Water	Water Quality Problem or Threat		
	Bacteria	Dissolved Oxygen	Toxic Contamination
Piscataqua River estuary			X
Spruce Creek	X	X	X
York River estuary		X	
Ogunquit River estuary	X	X	
Webhannet River estuary	X	X	
Scarborough River estuary	X		X
Royal River estuary	X		
Cousins River estuary	X		
Harraseeket River estuary	X		
Maquoit Bay	X		
New Meadows River estuary	X	X	X
Medomak River estuary	X	X	
St. George River estuary	X	X	
Weskeag River	X	X	
Rockland Harbor	X		X
Union River estuary	X		
Machias River estuary	X		

*some of these estuaries are on the 2000 Nonattainment List (see Appendix)

Table 4-29 Salmon River Watersheds

Salmon River Watersheds	
Denny's River	Machias River
East Machias River	Narraguagus River
Pleasant River	Ducktrap River
Sheepscot River	Cove Brook *

* not included as a priority in the 319 program because it was added as a salmon river after the 319 list was developed

New Meadows Estuary Watershed Project

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Related Website: http://academic.bowdoin.edu/new_meadows/

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Figure 4-7 New Meadows River Watershed and the Towns that are in the Watershed

(Source: the following is from the Executive Summary of the State of the New Meadows River Estuary report and the New Meadows River Watershed Project Website)

The New Meadows River is a Category 4-C listed estuary. The New Meadows River Watershed Project (NMRWP) is a collaborative effort of the municipalities of Brunswick, West Bath, Harpswell, Phippsburg, and Bath, the Maine State Planning Office, the Maine Departments of Marine Resources and Environmental Protection, the U.S. Environmental Protection Agency, Casco Bay Estuary Project, Friends of Casco Bay, New Meadows Lake Association, Bowdoin College and MER Assessment Corporation.

The population of the watershed has increased steadily as more and more people have sought to exploit the area's natural resources, both terrestrial and marine, and more recently, to enjoy its natural beauty, way-of-life, and the recreational opportunities the river offers. The population has grown over 12-fold since the late-eighteenth century, and has more than doubled just within the past fifty years. As along much of the coast of Maine, this population expansion has caused a shift in land use from agriculture and resource exploitation to industrial-commercial and residential uses, particularly over the past ten to twenty years. This trend is expected to continue for the foreseeable future and will undoubtedly have some degree of impact on the New Meadows River.

Fortunately, the New Meadows River appears generally to have suffered little as a result of development along its shores and within its watershed. Water quality testing results indicate that the New Meadows River functions more as an embayment than a true estuary, since there is no substantial surface freshwater input other than local run-off. However, subsurface groundwater discharge from the bottom and Kennebec River flow from the south around Small Point may have a significant influence on the river's circulation and rate of exchange.

Dissolved oxygen and nutrient levels show water quality to be good to excellent throughout most of river. Similarly, toxic metals and chemicals testing of lobsters, mussels, and sediments also show that, with only a few exceptions, levels of these contaminants in the New Meadows River are generally low, similar to other areas of Casco Bay, and are not a matter of immediate concern.

Despite these generally good conditions, there are certain areas of the river that have proven susceptible to low oxygen events. Testing in the upper reaches of the river and in the New Meadows Lakes has shown that these areas occasionally experience low dissolved oxygen episodes during warmer months, a condition that can be exacerbated by, and perhaps even cause, periodic fish kills such as the “pogie” (Atlantic Menhaden) kills of the early 1990's.

Nutrient levels in these areas, particularly in the Lakes, are also higher than normal and are likely the cause of the extensive algal blooms experienced annually in this section of the river. Testing results have revealed a possible internal source of nutrient generation, specifically in a deep hole in the Lower Lake, the bottom of which routinely becomes totally oxygen depleted during summer months.

Testing by the Maine Department of Marine Resources reveals much of the river and its shellfish growing areas to be clean and safe for shellfish harvesting and consumption. However, actual and potential sources of bacterial contamination are currently causing a substantial portion of the shoreline to be closed to the harvesting of shellfish. These closures are a matter of considerable concern, for the New Meadows River supports a significant soft-shell clam resource that, in turn, is the base of a shellfish industry important to the local economies of the surrounding communities. Although the New Meadows River shellfish growing areas represent a relatively small portion of Maine's total shellfish growing area, production from its shellfish flats over the past four years has accounted for an estimated 7.5% of Maine's total soft-shell clam production, indicating the exceptional productivity of the this area. In 2000 it was estimated that the 2001 New Meadows River harvest of soft-shell clams could be as high as 16,735 bushels resulting in direct income to the harvesters of approximately $1.3 million and extended economic activity in the order of $3-$4 million. Substantial effort has therefore been made to identify and correct the existing sources of contamination to insure continued access to the resource, but much remains to be done.

One area of concern is the impact of discharges from recreational vessels at anchor overnight and weekends (e.g., “The Basin”). This activity may lead to the closure of adjacent shellfish harvesting areas. At present, the nearest pumpout is at the very

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head of the New Meadows River estuary, at the New Meadows Marina. While this facility is a great asset to boaters on the River, larger vessels cannot easily access it. The New Meadows River Watershed Project is exploring various options for assisting towns with the installations of pump-out facilities further down the River.

A 200-foot long barrier between Dingley Island and the Harpswell mainland both separated the north and south sections of the waterway and divided one of the town's richest clamflats. The structure had been accumulating sediments since its constructions in 1946 and the New Meadows River Watershed Project actively supported the replacement of the causeway with a small bridge in order to reestablish water flow and restore a portion of the original habitat. Construction of the bridge began in May 2003 and was completed in August 2003. The U.S. Navy provided labor for the bridge construction through its Innovative Readiness Training program. Funding for the project came from NOAA's community based habitat restoration program, the Gulf of Maine program on the Marine Environment, the Maine Corporate Wetlands Restoration Partnership, cash donations from Harpswell residents and in-kind match from a variety of sources. Elsa Martz of Harpswell developed the project and because of her tireless work over the course of seven years, through numerous steps and obstacles, she accomplished the finished product that is described above.

Numerous Service Learning Projects have been set up to involve college students in ongoing research and monitoring on the New Meadows River and lakes. Students in some Bowdoin College Geology and Environmental Studies courses have worked with various local groups and organizations and contributed valuable information on various aspects of the river.

OBD Removal

As of the summer of 2002, the town of Brunswick successfully removed all overboard discharges within its jurisdiction. The town of Harpswell has also succeeded in opening numerous shellfish harvesting areas.

Brigham's Cove Reopening

On March 14, 2003 over 1,500 acres of shellfish flats in Brigham's Cove and Round Cove were opened to clamming for the first time since the 1970's. Originally closed due to poor water quality caused by malfunctioning septic systems, gray water discharges, and licensed overboard discharge systems (OBDs), the opening was the result of five years of work by local watershed groups, state and municipal officials, property owners, and local volunteers to remove the seventeen sources of pollution affecting the flats. The Casco Bay Estuary Project coordinated the efforts of the Maine Department of Environmental Protection's Overboard Discharge Removal Program, the Towns of West Bath and Phippsburg, and property owners to successfully remove the OBDs. Once the OBDs were replaced, the New Meadows River Watershed Project brought together Maine Department of Marine Resources (DMR) staff with municipal officials from West Bath and Phippsburg to push for the removal of the remaining pollution sources. In October 2002, the clean-up was completed and local volunteers working in conjunction with the DMR conducted the necessary shoreline surveys that confirmed the area was pollution-free.

To minimize future environmental impacts to the river, the New Meadows River Watershed Project is beginning to work on the development of a watershed management plan for the New Meadows River that would involve all five municipalities located within the watershed. However, before such a plan can be prepared, the New

Meadows River Watershed Project (NMRWP) is working on completing and implementing the NMRWP strategic plan. This strategic plan includes activities related to improving the ecological and economic resources, education, and expanding public involvement.

Four activities identified in the strategic plan that the New Meadows River Watershed Project intends to undertake within the next year include:

- Conducting a 24-hour nutrient flux study (nutrient concentration and water flow) in spring and fall between the lakes and the upper river.
- Developing a water quality index for the New Meadows Lake and River (example parameters: dissolved inorganic nitrogen, particulate nitrogen, temperature, salinity, dissolved oxygen, light penetration, pH, chlorophyll)
- Assessing the feasibility of increasing tidal exchange in the lakes.
- Increasing volunteer monitoring in the New Meadows River to weekly samples in the summer, evaluating the number of sites to be monitored, adding parameters as needed, and conferring with the local communities.

Protection of Aquatic Life

(Designated use: Habitat for fish and estuarine / marine life)

Attainment of Dissolved Oxygen Standards

The Mousam River estuary, the Royal River estuary, and the Medomak River estuary are on the 2004 Category 5 impaired waters list because sections of these estuaries do not meet state standards for dissolved oxygen. The reasons for nonattainment are varied and include natural factors such as benthic respiration and physical circulation factors. The Piscataqua River estuary has a completed TMDL, but its implementation has not begun. The upper New Meadows estuary and “Lake” (estuarine salinities) also do not meet standards for dissolved oxygen. The assumed primary cause of nonattainment at this location is the partial impoundment on Old Route 1 at the Brunswick-West Bath town line. Additional monitoring and studies in this area are planned to better understand the cause(s) and to assist in finding solutions.

Generally, data from various studies and volunteer monitoring groups show oxygen levels along the Maine coast are adequate for the protection of aquatic life. Although some estuaries contain oxygen levels that do not meet the dissolved oxygen standards of their assigned classification, it was concluded that many of the lower levels measured were a result of natural processes. Preliminary data from the 2000 National Coastal Assessment for 29 stations randomly distributed along the Maine coast shows that 17% of the surface water samples did not meet SB class standards of 85% saturation even though all samples were above 6 mg/L. At depth, 45% did not meet SB standards although only one measurement was below 6 mg/L (5.73 mg/L). DEP reviewed the appropriateness of statutory dissolved oxygen standards for estuarine and marine waters during a two-year stake holder process and made a proposal to the legislature. The legislature chose to keep the statute as it currently exists with 85% saturation for SB waters and 70% saturation for SC waters.

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Eutrophication

Although there are estuaries that do not meet state water quality dissolved oxygen standards (see previous section), incidences of hypoxia (>0 to $\leq$2 mg/L dissolved oxygen) or anoxia appear to be episodic. New Meadows "Lake" (salinity over 20 ppt) has anoxic conditions in the deep hole each summer. Causes of these anoxic events have ranged from influxes of large schools of fish, algae blooms being blown into a small bay to unknown causes. While toxic algae blooms occur periodically in the spring and summer, the blooms are showing no trends and are not considered to be related to nutrient enrichment from anthropogenic sources. No nuisance blooms (e.g. Phaeocystis) have been reported recently. Trends in macroalgal abundance of green algae (e.g. Enteromorpha) are unknown but the abundance appears to be increasing in some areas and is of concern to some of the coastal volunteer groups. However, the presence of Enteromorpha does not automatically indicate pollution.

In a statistical analysis conducted for the 1996 dissolved oxygen study for 16 estuaries along the coast of Maine (Dissolved Oxygen in Maine Estuaries and Embayments: 1996 Results and Analyses by John Kelly; Aug. 30, 1997; DEPW97-23), the results suggested land-derived nitrogen loading source. In many areas, particularly those from eastern Maine to offshore Penobscot Bay, a major nutrient source appears to be from offshore waters. Overall, the high tidal range, the relatively low river flows (except the Penobscot and the Kennebec), the relatively low population densities in most areas and limited agricultural nutrient runoff results in limited anthropogenic impacts at this time. Small, poorly flushed bays that have watersheds with growing populations are where signs of eutrophication such as nuisance macroalgae, occasional phytoplankton blooms in the summer and lowered dissolved oxygen levels have started to emerge. At this time the impaired use is principally from the toxic algae blooms. The Department of Marine Resources with the help of volunteers (see below) closes shellfish harvesting areas to protect public health when toxic algae blooms ("red tide") occur. Closures because of toxic algae blooms extended later into the fall in 2003 than in previous years.

Maine Phytoplankton Monitoring Program

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In 1996 the United States Food and Drug Administration, the Maine Department of Marine Resources (DMR), and the University of Maine Cooperative Extension/Maine Sea Grant developed the Maine Phytoplankton Monitoring Program for the coast of Maine. For the success of Maine's shellfish resources, this active monitoring program picks out and observes toxic phytoplankton. This is a citizen volunteer program in which community members and students use plankton nets and field microscopes to monitor for phytoplankton that have the potential to cause harmful algal blooms (HAB's also known as "red tides"). This volunteer program was designed to act as an early warning system for HAB's, which may cause shellfish bed closures due to biotoxins. The volunteers use data sheets to report the relative abundance of target species such as *Alexandrium* spp., *Dinophysis* spp., *Prorocentrum lima*, and *Pseudonitzschia* spp. to the DMR in real-time. These types of phytoplankton may "bloom" in a given area when conditions are right, and an active monitoring project can be extremely effective in promoting shellfish safety to the public by identifying these organisms and determining when they are present. This information is then used by the DMR biotoxin monitoring program to assist in prioritizing the need for testing shellfish meat for biotoxins. Approximately 75 volunteers monitor 40 sites coast-wide on a weekly basis April through October (or later if conditions warrant).

If shellfish ingest the toxic phytoplankton they are not infected, but do carry the marine biotoxin. If a human ingests the shellfish carrying the toxin, it may result in sickness and, (depending on the toxin involved) in some cases death for the human.

In Maine, monitoring for marine biotoxins is conducted by the Maine Department of Maine Resources (DMR), who monitor for Paralytic Shellfish Poisoning (PSP) which is caused by *Alexandrium* spp*.* There are other toxic algae that could potentially be present in Maine waters, for which monitoring is not generally conducted. These algae include, *Pseudonitzschia* spp., which causes Amnesiac Shellfish Poisoning (ASP), and *Dinophysis* spp., which causes Diarrhetic Shellfish Poisoning (DSP). Volunteer based monitoring efforts are an integral part in providing information on toxic algae blooms that aid the DMR in the methods currently used for quantifying marine biotoxins.

Program Achievements:

Trained volunteers reliably notify the Maine Department of Marine Resources when there are increases in potentially toxic phytoplankton cells present along the coast of Maine.

- Education on harmful algae blooms is provided in 40 coastal communities annually
- Over 3,500 recorded observations of phytoplankton species have been entered into a database
- Citizen participants range in age and background from high school students to retired scientists
- In the fall of 1999, a methodology for counting phytoplankton cells was developed and is being utilized by one of the volunteer groups to provide information about phytoplankton populations to finfish aquaculturists
- In 1997-8, using information on the large Dinophysis populations from the volunteer monitoring effort, a NOAA biotoxin team was assembled to determine if diarrhetic shellfish poisoning (DSP) occurs along the coast of Maine. This was the first study demonstrating the possibility of DSP on the Maine coast. Since okadaic acid (Dinophysis toxin-1) was detected in the dinoflagellate *Prorocentrum lima*, a protocol for volunteer monitors to identify *P. lima* has been developed and the protocol, after further field testing, will be implemented in the future.

New and On-Going Projects

- Creation of "Field Guide to Phytoplankton in the Gulf of Maine" with color images from a light microscope and field notes
- Incorporating aquaculturists to determine if the monitoring data is useful in developing management strategies

Attainment of Aquatic Life Standards

Contact: Lee Doggett, Director, Marine Environmental Monitoring Program, DEP BLWQ, Division of Environmental Assessment

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General

Much of Maine's intertidal zone habitat supports marine life (plants and animals) as naturally occurs and meets Class SA standards. However, much of Maine's subtidal habitat is altered by "dragging" techniques that are used to harvest certain species. Therefore, it is hard to assess which areas meet classification standards without examining site-specific information on the bottom dwelling (invertebrate) community at a particular time. Examples of Maine's intertidal habitats include:

High Wave Energy Rocky Shore

Maine has more miles of intertidal bedrock than the rest of the entire East Coast of the United States. The diversity of marine plants and animals in this habitat is unusually rich, particularly in locations where there are tidepools, cracks and crevices in the lower intertidal zone for the animals to take shelter. Also, some plants and animals (e.g., kelp holdfasts, mussel mats and sponges) provide habitat for other animals. Boulder beaches in some high wave energy areas have a more diverse animal community than the bedrock shores. The abundance and diversity of plants and animals at boulder beaches vary depending on the shape and spacing of the boulders and the wave exposure. Juvenile lobsters are often found in this habitat.

Over one hundred species of plants and animals live on Maine's high wave energy rocky shores. Threats to high energy rocky shores can come from over-collecting of intertidal marine animals (although there is no evidence of this in Maine to date), harvesting of seaweed and physical habitat alterations (e.g., docks, piers, etc.)

Intertidal Flats

Maine has 93.2 square miles of intertidal flats. These flats are predominantly muddy and generally harbor a more diverse community of animals than high wave energy rocky shores. Numerous factors (e.g., sediment grain size, sediment deposition rates, salinity, temperature ranges, etc.) determine the diversity and abundance of animals living in a particular flat. Intertidal flats are habitat for three important commercial species: soft-shell clams, bloodworms, and clamworms. Threats to intertidal flats can come from over-harvesting, physical habitat disturbance (e.g., harvesting, docks, piers, etc.), changes in stormwater runoff patterns, runoff frequency and runoff volume, sawdust deposits, over enrichment by nutrients, and toxic contamination.

Low Wave Energy Coastal Habitat

In areas where there is low wave energy, the typical Maine coastal habitat includes a mixture of habitat types (e.g., rocky shore, mudflats, sandflats, flats mixed with gravel, cobble and/or boulders, high salt marsh (Spartina patens), and/or low salt marsh (Spartina alterniflora). The plant and animal community inhabiting the area depends on the specific habitat present. Low wave energy rocky shores are usually dominated by Ascophyllum (knotted wrack or seaweed) and have far fewer plant and animal species than either the high energy rocky shores or intertidal flats (both described above). Marshes harbor mudflat species as well as species that are especially adapted to live in salt marshes (e.g., the shrimp-like amphipod, Orchestia ulheri; the salt marsh snail, Melampus bidentatus).

Areas containing gravel and cobble tend to have the lowest diversity of animals and usually have few, if any plants (because these materials move back and forth with the waves and during storms). The abundance and diversity of plants and animals at boulder beaches vary depending on the characteristics of the boulders and the wave exposure, among other factors.

As is the case for flats, numerous factors (e.g., sediment grain size, sediment deposition rates, salinity, temperature ranges, etc.) determine the diversity and abundance of animals living in a particular habitat. Threats to low wave energy coastal habitats can come from over-harvesting (including taking "pet" rocks from gravel or cobble beaches), physical habitat disturbance (e.g., harvesting, docks, piers, etc.), changes in stormwater runoff patterns, runoff frequency and runoff volume, sawdust deposits, over enrichment by nutrients, and toxic contamination. Riparian zone disturbance also can impact the functions of marsh habitat.

Sand Beaches

Maine has 12.6 square miles of sand shore habitat. Maine sand beaches harbor species that are specialized for existence in sands that constantly shift in response to the constant battering and movement by waves. Species that are typically found on sand flats are also known to exist in some of the more protected sandy beach environments. Numerous factors (e.g., sediment grain size, exposure, salinity, temperature ranges, etc.) determine the diversity and abundance of animals living in a particular sand beach. Threats to sand beaches can come from physical habitat disturbances (e.g., buildings, piers, walkways, beach scraping, etc.) of the beach or the dune system, changes in stormwater runoff patterns, runoff frequency and runoff volume, over enrichment by nutrients, and toxic contamination.

Habitats Where Aquatic Life Standards are Threatened

Fringing Marsh

Small pockets of intertidal salt marsh or fringing marsh are an important and threatened habitat in Maine. The ribbed mussel (*Modiolus demissus*) is dependent upon intertidal salt marsh environments for its survival. They inhabit areas of the marshes that are associated with plants by burying half to three-quarters of their shells among the root systems.

Case Study: Ecological Functions and Values of Fringing Salt Marshes in Casco Bay

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Nine fringing salt marsh sites in Casco Bay were studied. The primary objective was to gather baseline information about important fringing marsh functions that could be used by resource managers in marsh recovery and settlement efforts following an oil spill. The project intended to clarify the value of fringing salt marshes in Casco Bay to invertebrate and finfish production, to vegetation production and diversity, and as buffers against sea level rise and coastal erosion.

The study found that fish using the nine marsh sites were the same species that are typically found in larger, meadow salt marshes. These fish included resident fish (mummichog, silversides, sticklebacks), juvenile marine fish (winter flounder, hake), migratory species (rainbow smelt, tomcod, American eel, alewife), and marine transient fish (Atlantic herring, striped bass, mullet). Crustaceans (green crab, Jonah crab, sand shrimp, hermit crab) were also caught in the fishing nets. Green crabs, which are an invasive species, were found in high abundances at most sites. Further research will clarify the role of these crabs in the marsh environment, especially their effect on mummichogs, a common and important salt marsh fish (Figure 4-8).

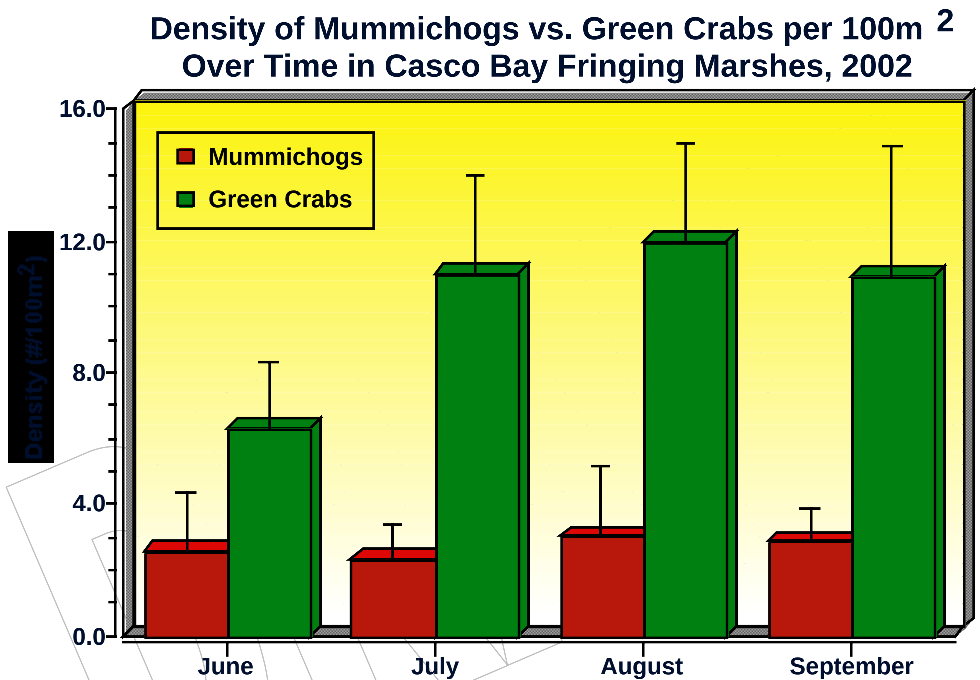

Figure 4-8 Density of Mummichogs vs. Green Crabs in Casco Bay

Invertebrates found in the upper five centimeters of marsh soil included wormlike animals: nematodes, oligochaetes, and polychaetes. These worms are an important food source to fish as they are soft bodied, easy to digest, and readily available. Densities of these worms were high, ranging from 3,000 to 10,000 per m^2. Tiny shrimp-like animals (tanaid crustaceans), another important food source for fish, were also found in high densities. Periwinkles, clams, green crabs and several fly larvae occurred in lower numbers.

Primary productivity of marsh grasses varied widely from site to site (35-309 g/m^2) (Figure 4-9), as did the amount of sediment deposited on the marsh surface over short periods of time (2.2-9.8 g/m^2/day) (Figure 4-10).

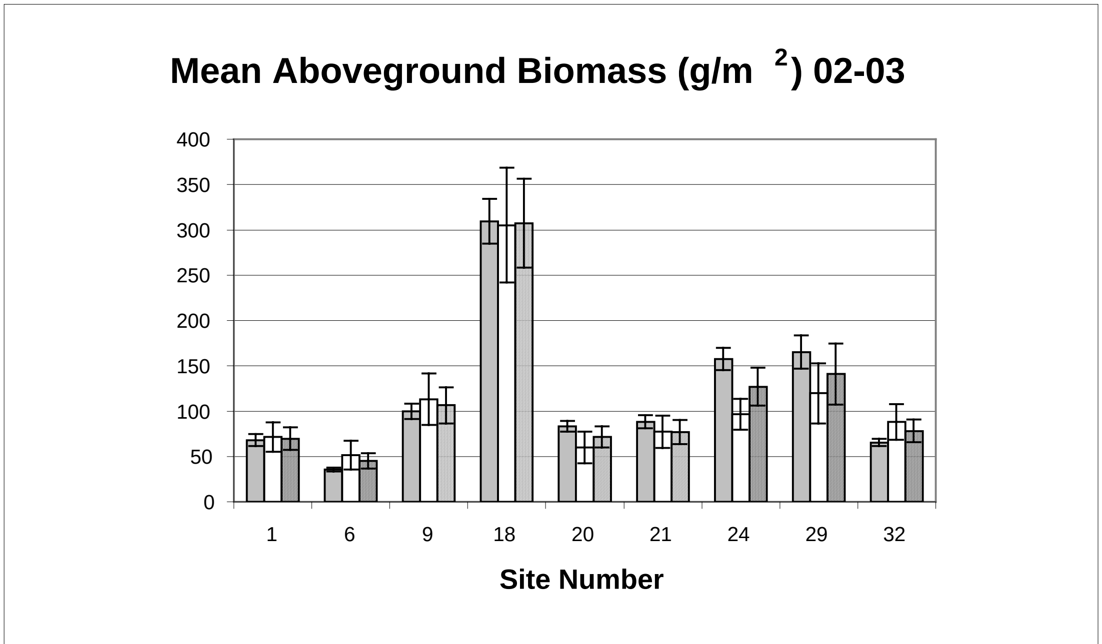

Figure 4-9 Primary productivity of fringing marsh sites in Casco Bay, measured by end-of-season standing biomass in 2002 and 2003.

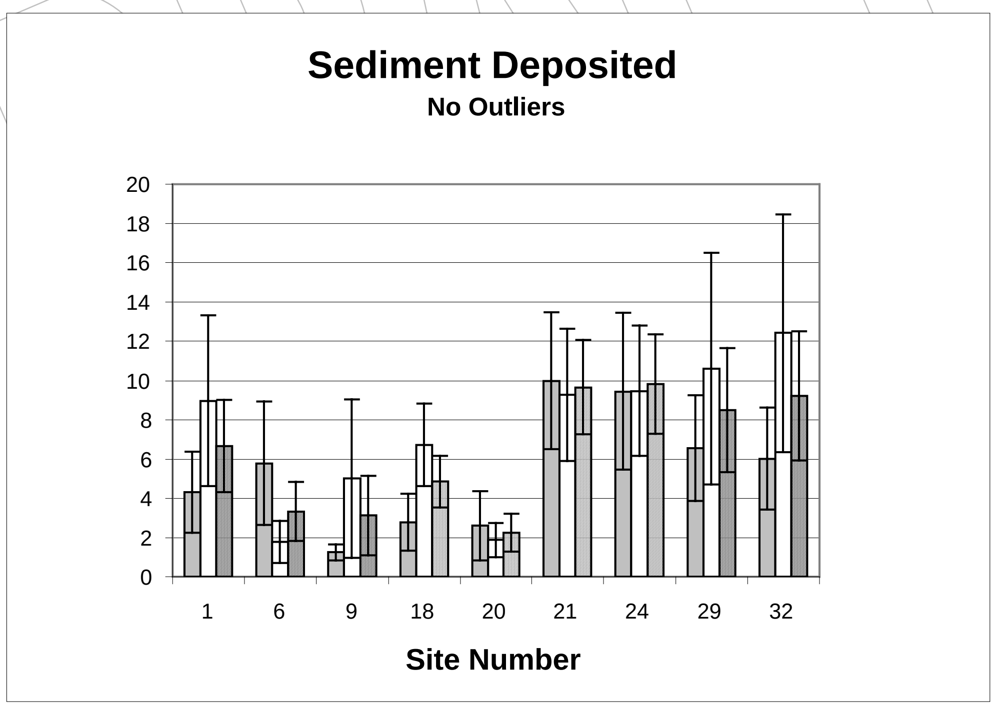

Figure 4-10 Sediment deposited on the surface of fringing marsh sites in Casco Bay. Values are means of two-week periods in June and July, standardized to g/m2/day.

Sediment deposited over a longer time span (15 months) also varied from site to site, ranging from 0-0.74 cm (Figure 4-11). There is not enough information from this preliminary study to determine how well these sites are keeping up with local sea level rise.

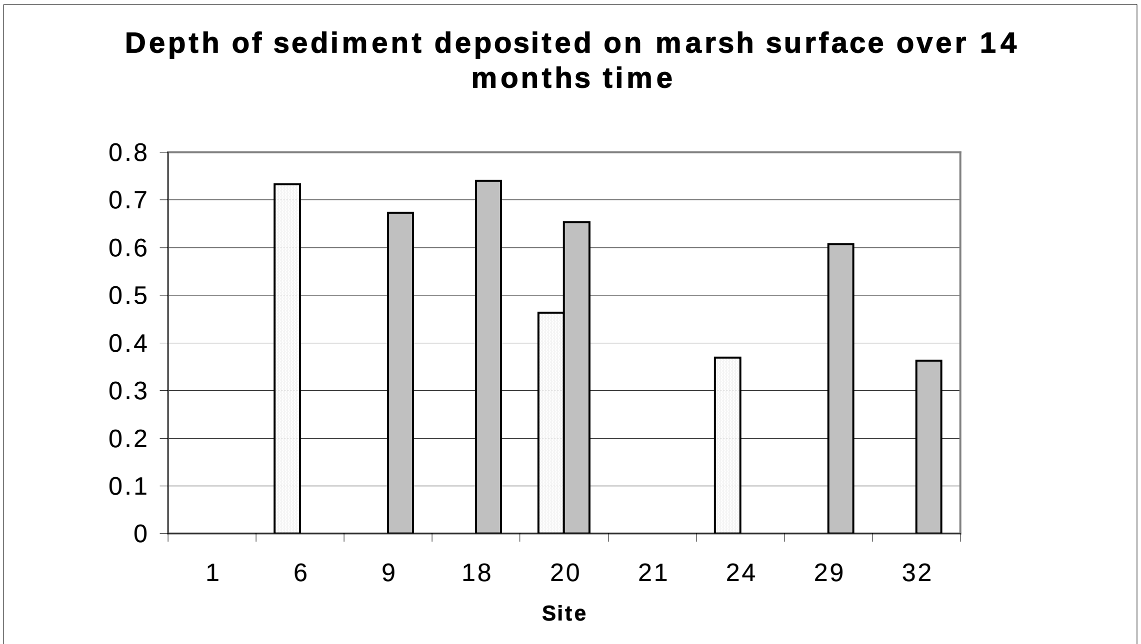

Figure 4-11 Depth of sediment deposited on fringing marsh surfaces accumulated over 14 months' time. Nd = no data.

Many marshes were observed to have well-developed high marsh plant (*Spartina patens)* communities, although one site had only a low marsh zone dominated by *Spartina alterniflora* (Fig. 4-12). The number of plant species identified at sites ranged from 10-20, and diversity (as measured by the Shannon Index [H]) varied from 0.187 to 0.696.

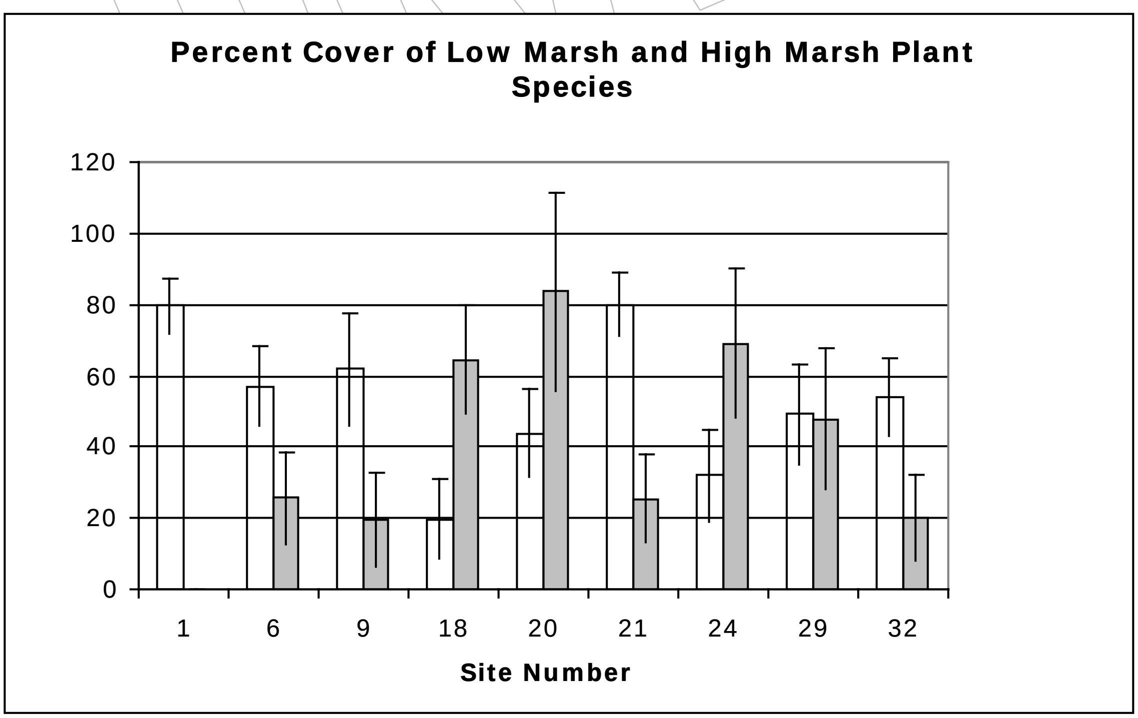

Figure 4-12 Percent cover of low and high marsh plant species on fringing marsh sites in Casco Bay.

Results from this study demonstrate that fringing salt marshes are playing an important role in the ecology of Casco Bay, especially in estuarine food web support and in the maintenance of plant and animal biodiversity.

The results also highlight the high levels of variability that exist between these marshes. However the sample size of nine marsh sites allows us to begin to understand this variability, and to provide baseline information to resource managers about the marsh functions we investigated. This baseline information will be helpful in assessing future impacts to fringing salt marshes in Casco Bay.

Eelgrass

Eelgrass Distribution

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Coast-wide mapping of eelgrass beds based on 1:12,000 scale color photography has been an on-going effort of the Maine Department of Marine Resources (DMR) since 1993. The first coast-wide mapping of this feature was completed in 1997. Combined with the work of Dr Fredrick Short of UNH and Salmon Falls Consulting for MDOT in 1993, these studies represent a uniform benchmark of eelgrass distribution. DMR began a new mapping effort in 2001, with the objective of systematically revising mapped distribution and documenting change in eelgrass distribution.

Eelgrass forms the basis of an important habitat along the Maine coast. Though it has not been studied as intensively north of Cape Cod as in locations to the south, there is a fair amount known about distribution and biology of eelgrass in the region. As in other locations, eelgrass can form dense meadows in shallow subtidal and, to a lesser extent, intertidal locations. It serves many of the same functions as eelgrass beds elsewhere, in that it is a dominant primary producer, provides habitat for many organisms, and serves to stabilize near shore sediments.

The extent of area covered is shown in Figure 4-13. Work reported here represent the first locations on the coast that have been revisited since the project was initiated in 1993. Additional details on methods used to conduct this analysis are available from DMR.

Eelgrass beds were mapped in shallow waters between Biddeford Pool, Saco Bay and Small Point, Casco Bay. Similar methods were used in the re-mapping efforts as were used in the original mapping. Field verification was added because of improved technology, which included benthic mapping equipment and an underwater video system.

Total area of all cover categories in the recent survey was 8,655 acres and is shown in Table 4-30. This is a 19% increase since the original survey, when the total was 7,270 acres. Eelgrass beds that were present in 1993-95 were, in most cases, also were found in the present study. A total of 5,449 acres had eelgrass in both the 1993-95 and 2001-02 period. There were a total of 3,206 acres of new eelgrass beds and 1,744 acres where eelgrass cover was lost, for a net increase of 1,462 acres.

The increase in coverage of eelgrass beds confirms a trend noted in the study of impacts of mussel dragging on Maquoit Bay (Barker, 2003). Based on photography from 1993, 1999, 2000, 2001, and 2002, there appears to be a continued increase in coverage of eelgrass in Maquoit Bay. This was not the case throughout Saco and Casco Bays, where there were large areas of decreased coverage in Broad Cove, north of Cousins Island, west of upper Great Chebeague Island, and in the vicinity of Upper and Lower Goose Islands.

It is not apparent in other locations what factors might be responsible for the decline. Aside from the immediate impacts of mussel dragging and propeller wash, which it is assumed could cause localized impacts, decreased water quality or disease may be responsible for more widespread changes. The importance of light penetration as well as the detrimental effects of high nutrient loading have long been known (Short, et al, 1993). Another factor known to be responsible for major declines of eelgrass is the eelgrass pathogen, Labyrinthula.

<u>Literature Cited:</u>

Barker, 2003: Effects of Commercial Fishing on Eelgrass in New England: Characterization of Impacts and Measurements of Regrowth - Results of High Altitude Photography. Report to USGS Eastern Regional Office - State Partnership Project. 21 pp.

Table 4-30 Change in Eelgrass Cover by Category.

Sum of Acres	**Percent Cover**					
Old	**None**	**0 to 10 %**	**10 to 40 %**	**40 to 70 %**	**70 to 100%**	**Grand Total**
None		164.098	798.704	486.827	1,757.361	3206.99
0 to 10 %	286.776	53.028	249.043	69.089	255.555	913.491
10 to 40 %	327.862	21.711	207.153	91.018	608.237	1,255.981
40 to 70 %	439.16	28.258	204.761	234.613	562.601	1,469.393
70 to 100%	690.792	43.133	408.058	184.813	2227.47	3,554.266
Grand Total	**1,744.59**	**310.228**	**1,867.719**	**1,066.36**	**5,411.224**	**10,400.121**

2001-02 Total
8,655 acres

1993-95 Total
7,193 acres

Cover Change Category		**Area (Acres)**
Unchanged		**5,449**
Increase	**(New)**	**3,207**
Decrease	**(Loss)**	**1,745**

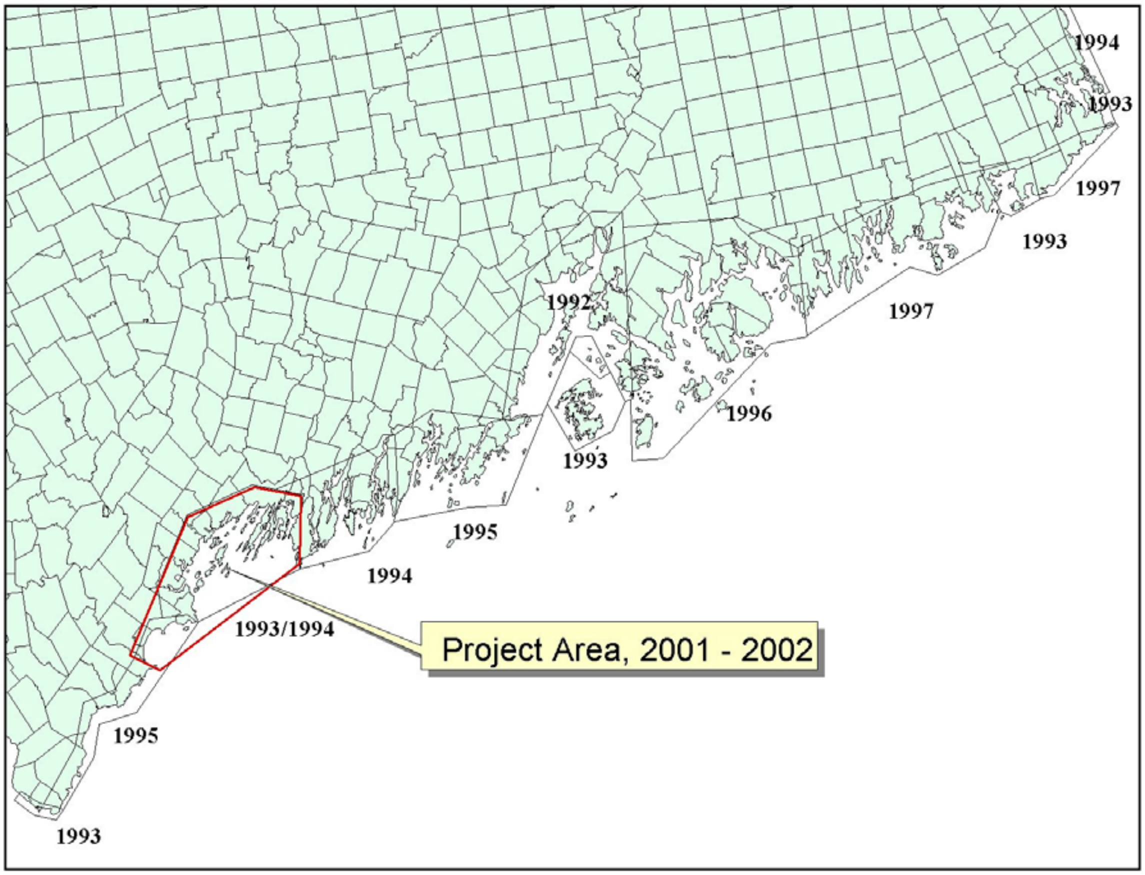

Figure 4-13 Area of Interest, 2001/2002, and Dates of Initial Mapping

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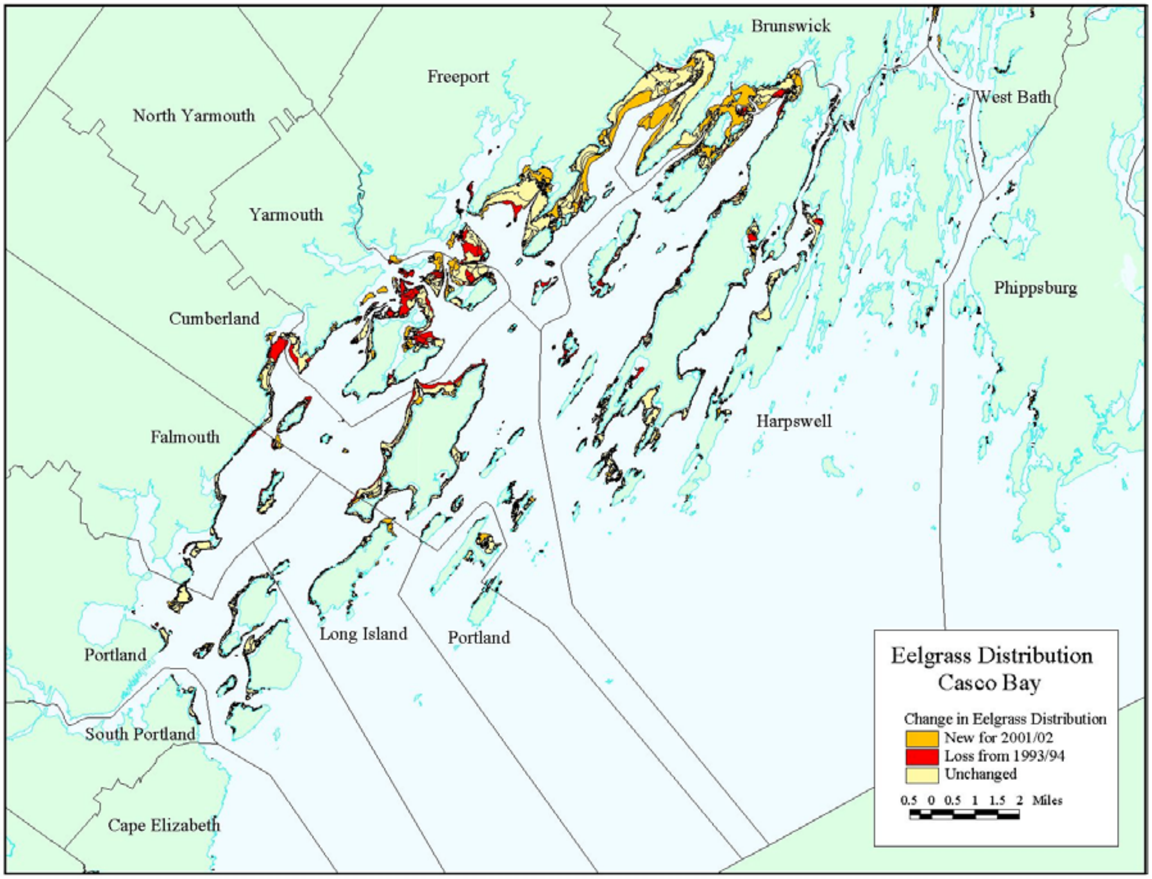

Figure 4-14 Change in Eelgrass Distribution

Habitats Where Aquatic Life Standards are in Nonattainment

The Fore River estuary is listed in Category 5-A (Waterbody # 804-7; see Appendix III Category 5-A) because of nonattainment of aquatic life standards, toxics and bacteria. The aquatic life standards of the inner Fore River estuary between the Casco Bay Bridge and the Veteran's Memorial Bridge is does not meet aquatic life standards. The structure and function of the bottom dwelling (benthic) animal (invertebrate) community has been altered because of multiple point and nonpoint sources of pollution in this area.

A significant source of pollution is the former Gasworks plant (upstream of the bridge on the Portland side) where the coal tar that is buried oozes out of the site during hot weather. The intertidal zone in the area is "paved" with coal tar and when the coal tar reaches the water, oil slicks result. The sediments in the channel contained coal tar when they were sampled in 1989. Since that time, the channel has been dredged so the sedments that were in the channel in 1989 are at the Portland Disposal site or in the bumpers for the Casco Bay Bridge. However, since then, coal tar has continued to seep into the Fore River estuary. After a long process that included DEP and several Federal agencies, the responsible party is participating in a voluntary clean-up of the site. Remediation of the site is scheduled to begin in 2004.

Other areas of nonattainment of aquatic life standards are in the vicinity of a few finfish aquaculture sites. These operations are licensed by DEP and appropriate actions (e.g., fallowing, additional monitoring, etc.) will be required in order to allow the sites to recover (usually one or two years).

Areas that are dredged and areas where the dredged materials are deposited at sea are in temporary nonattainment for approximately one or two years after the disturbance. Disposal of dredged material at sea is becoming more of a problem as the designated sites become filled (especially the Cape Arundel site in southern Maine). Also, there are no properly designated sites in Downeast Maine east of the Rockland disposal site. Historic disposal sites have been and are being used. However, the environmental assessment prior to disposal is limited. If a site were properly designated, it would require an Environmental Assessment or an Environmental Impact Statement.

Toxic Contamination

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Several programs have monitored toxic contaminants along Maine's coast in 2001, 2002, and 2003 including: the National Coastal Assessment Program, the Surface Water Ambient Toxics Monitoring Program, the Gulfwatch Program of the Gulf of Maine Council, and the Casco Bay Estuary Project. Toxic contaminants were monitored both in surficial sediments and in blue mussel tissue. In previous years, lobster tissues and tomalley along with cormorant feathers and blood have been monitored for toxics. Sediments also have been analyzed for various dredging projects (e.g., in the towns of Camden, Rockland, and Millbridge).

Sediments

Generally, fine-grained sediments are found in waters that are downstream/down current of areas with high human densities, such as the mouths of major rivers and ports, and contain higher levels of toxic contaminants. Polycyclic aromatic hydrocarbons (PAHs) are especially high in areas where petroleum is routinely handled, such as: marine terminals, marinas, and urban areas. In Casco Bay, tributyl tin (TBT) from antifouling paints was highest in concentration near areas of boating activity in the inner Bay near Portland, Falmouth Foreside and the Anchorage on the inner part of Hussey Sound. Polychlorinated biphenyls (PCBs), and DDT, though not sold for 20 years, continue to be present in sediments along the whole coast, although they are more pronounced near centers of commerce and industry.

Mussels

Blue mussel soft tissue has been analyzed periodically from approximately 65 sites along the Maine coast over a period of 17 years. The Marine Environmental Monitoring Program established normal baseline reference concentrations for different contaminants for metals in mussels, with the exception of arsenic. Arsenic was compared to the NOAA-defined elevated levels (referenced below). When compared to these reference concentrations, some sites had contaminant levels above the Maine coastal norm. Most, however, did not. Those tissue samples that were elevated generally were in the most heavily developed ports and harbors or were in the mouths of major industrial rivers. Organics (PAHs or polycyclic aromatic hydrocarbons, pesticides, PCB or polychlorinated biphenyls) are compared to elevated levels reported in the National Oceanic and Atmospheric Administration (NOAA) 1998 (on-line) “Chemical Contaminants in Oysters and Mussels” by Tom O’Conner. NOAA’s State of the Coast Report. Silver Spring, MD: NOAA

In 2001, areas that had metals (arsenic, cadmium, chromium, copper, nickel, lead, zinc, silver and mercury) that were above the Maine coastal norm are presented in the following table. The text below compares those results to previous samples taken in the late 1980s. The samples from the late 1980s consisted of a single sample while the 2001 results are based on four replicate samples. Aluminum and iron were not included in the analysis and are reported as elevated in the table to give an indication of the amount of sediment in the gut of the mussel. PAHs were tested for, however, the results of these analyses indicate that they were not elevated at any of the sampling sites.

Table 4-31 Elevated Metals (X) in Mussels Sampled in 2001

	Al	As	Cd	Cr	Cu	Fe	Ni	Pb	Zn	Ag	Hg
Castine – Brooksville			X		X			X	X		
Clough Point, Sheepscot River Estuary	X					X					X
Roque Bluffs, Englishman’s Bay	X										
Great Diamond Island, Casco Bay	X	X				X		X		X	
Goose Ledge, Damariscotta River estuary							X				
Kittery, Pepperell Cove	X	X		X	X	X		X			X
Machiasport, Little Kennebec Bay	X					X				X	
Long Island, Casco Bay							X				
Medomak River estuary							X*			X	
Sandy Point – Stockton Springs, Penobscot River estuary	X										X
Sears Island, Searsport							X				

*without outlier, not elevated

Mercury was elevated in the Sheepscot River at Clough Point, at Pepperell Cove in the town of Kittery and at the mouth of the Penobscot River at Sandy Point, Stockton Springs. The one previous sample that was taken at Sandy Point in 1989 had elevated cadmium, chromium and slightly elevated levels of nickel, as well as elevated mercury. By comparison, levels of cadmium and chromium are now in the high end of the normal range and nickel is normal at over one-third less than it was previously.

The one sample that was collected previously in 1989 at the Sheepscot River at Clough Cove had slightly elevated cadmium as well as elevated mercury levels. In the 2001 sample, cadmium was in the high end of the normal range and mercury was still elevated.

At Pepperell Cove near the naval base in Kittery, the one sample taken in 1987 had elevated chromium, lead and mercury, while zinc, cadmium, and copper were in the high normal range. In 2001, mercury, chromium, copper, lead and arsenic were

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elevated (arsenic was not measured in 1987). Cadmium and zinc were in the high normal range in 2001 but they were slightly lower than the levels found in 1987.

Metals in Englishman's Bay were in the normal range in both 2001 and 1987.

Metals in the Medomak River estuary were in the normal range except for elevated silver, (which had varied results between the replicate samples). There was an outlier in one of the nickel replicates and it was not considered in the results. Cadmium was elevated in the one sample taken in 1989, but it was not elevated in the 2001 sample.

Goose Ledge in the Damariscotta River estuary, Sears Island in Penobscot Bay and Long Island in Casco Bay are in the normal range with the exception of elevated nickel. Although the levels of nickel are higher in 2001 than the one sample taken during 1989 in the Damariscotta River, the results of replicates were highly variable. Two replicates were in the elevated range while two were in the normal range for nickel. At Sears Island, the levels of silver and cadmium are greatly reduced from the one sample taken in 1989, but the level of nickel is higher in the 2001 sample. Levels of cadmium, lead and zinc are reduced from the one sample taken in 1989 at Long Island, while the level of nickel has increased.

In Little Kennebec Bay, the metals are in the normal range with the exception of silver (thatwhich was not measured in 1987). Also, the lead levels that were in the high end of the normal range in the one 1987 sample are reduced in 2001.

Diamond Cove on Great Diamond Island in Casco Bay had elevated arsenic, silver, and lead levels in 2001. In the one sample taken in 1988, all metals analyzed were in the normal range. Silver and arsenic were not analyzed in 1988. Lead was in the upper part of the normal range in the 1988 sample and now lead is almost twice as high as it was in 1988.

On Cape Rosier in Penobscot Bay, near an abandoned mine, cadmium, copper, lead and zinc were elevated in 2001. In the one sample taken in 1989, cadmium, lead and zinc were also elevated. Levels of cadmium and lead are lower, while levels of copper and zinc are higher in 2001 – when compared to the 1989 sample.

In summary, levels of mercury were elevated in the Sheepscot River estuary, Pepperell Cove in Kittery and at the mouth of the Penobscot River both in 2001 and in the late 1980s. The latter two sites have potential local sources of mercury, while the Sheepscot River estuary is presumably elevated because of historic sources. Levels of other metals were lower in 2001 than in the late 1980s at many sites, including the Sheepscot and the Penobscot. Pepperell Cove near the naval base in Kittery had elevated or high normal range metals during both sampling periods. At the mouth of an abandoned mine in Cape Rosier, a number of metals were elevated in the 1989 and 2001 samplings. One area of concern is Diamond Cove, on Great Diamond Island in Casco Bay where levels of lead are much higher than in 1989.

Other locations had lower levels of metals or normal levels at both samplings with some exceptions. Nickel was elevated in some of the 2001 samples, but the individual replicates had variable results. Silver was elevated at two locations and also had variable results for individual replicates.

In 2001, the Casco Bay Estuary Project sampled mussels at East End Beach, Portland; Spring Point, South Portland; Mill Creek, Falmouth; and Upper New Meadows, Brunswick and West Bath. Metals (arsenic, cadmium, chromium, copper, nickel, lead, zinc, silver and mercury) were in the normal range at Upper New

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Meadows and were elevated at the other locations of East End Beach, Spring Point, and Mill Creek. These three locations had elevated lead, although less so at Spring Point than the other two locations (probably due to less urban runoff). East End Beach had elevated zinc levels and zinc was also slightly elevated at Spring Point. When compared to the single replicate samples taken in 1988 at East End Beach, Mill Creek and Spring Point, lead and zinc at East End Beach remains elevated and lead remains elevated and zinc slightly elevated at Spring Point. The only noticeable change from the 1988 sampling was at Mill Creek, where levels of lead went from the normal range (2.90 ppm for a single replicate) to elevated (an average of 5.51 ppm for four replicates). There has been a lot more commercial development in the Mill Creek watershed since 1988 and the development of the Mill Creek watershed has continued beyond the time of sampling in 2001. The Upper New Meadows River was not sampled previously, so there was no basis for a trends comparison. Aluminum and iron were not included directly in the analysis. PAHs, PCBs and pesticides were in the normal range at all sites; however, there are some quality assurance issues with these results that should add caution this statement.

The following sites were sampled in 2002: the former Navy Pier, Harpswell Neck, Casco Bay; inner Fore River, upstream of the I-295 Bridge, Casco Bay; Maquoit Bay, Brunswick, Casco Bay; mouth of Harpswell Cove (off Mare Brook), Casco Bay; Seal Cove, Mount Desert Island; Western Passage, St. Croix River. Each of the above samples consisted of four replicates.

Metals (arsenic, cadmium, chromium, copper, nickel, lead, zinc, silver and mercury) were in the normal range in all locations except the inner Fore River. Aluminum and iron were not included directly in the analysis. Mare Brook and the inner Fore River had elevated levels of aluminum and iron and Maquoit Bay and the St. Croix Bay had elevated levels of aluminum. These elevated levels give an indication of the amount of sediment in the gut of the mussel.

The inner Fore River had elevated levels of lead. Also, zinc was at the high end of the Maine coastal norm and mercury was over the high concentration level reported in the National Oceanic and Atmospheric Administration (NOAA) 1998 (on-line) “Chemical Contaminants in Oysters and Mussels” by Tom O’Conner. NOAA’s State of the Coast Report. Silver Spring, MD: NOAA. In the one sample taken in 1988, zinc was elevated when compared to the 2002 sample. Lead concentration has more than doubled in the 2002 sample, while mercury is in a range similar range to what it was in 1988.

Mare Brook, Maquoit Bay and the St. Croix River have never been sampled before. Metals at the former Navy Pier, Harpswell Neck were in the normal range in 2002 and 1988. Metals at Mount Desert Island were also in the normal range in 2002 and 1991.

PAHs were highly elevated at the inner Fore River site and slightly elevated at the St. Croix site. PAHs were approaching elevated levels at the Maquoit Bay site. PAHs, PCBs and pesticides were in the normal range at all other sites except for PCBs at the Fore River site, which were approaching elevated levels.

Summary

Elevated levels of toxic contaminants tend to be present in harbors, commercial ports, mouths of river watersheds and locations adjacent to population centers. Areas that have a “dirty history” (i.e., manufacturing or some other past activity) may still be a source of toxic substances. However, the geographic extent of toxic contamination

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tends to be localized. Most areas that are away from human activity, past and present, contain natural background concentrations of toxic contaminants. Based on the above sediment and tissue analyses, areas of concern include six areas of Maine's coast, which are summarized in (Table 4-32).

Table 4-32 Marine and Estuarine Areas of Concern for Toxic Contamination[1]

Location	Area
Piscataqua River Estuary	2,560 acres
Fore River	1,230 acres
Back Cove	460 acres
Presumpscot River Estuary	620 acres
Boothbay Harbor	410 acres
Cape Rosier	80 acres

[1] Acreage based on professional judgement. Empirical evidence to conclude non-attainment or adverse impact is lacking. Biological standards must be developed to assess attainment and monitoring must be conducted to assess impact.

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Seals

Contact: Susan D. Shaw, Dr. P.H., Executive Director, Marine Environmental Research Institute (MERI)

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Related Website: www.meriresearch.org

Harbor seals (*Phoca vitulina concolor*) are widely distributed in the temperate nearshore waters of the Gulf of Maine and are useful sentinels of food chain contamination because they occupy a high trophic level, are long-lived, and accumulate high concentrations of persistent organic pollutants (POPs) and heavy metals including mercury.

A large body of data suggests that environmental contaminants, particularly PCBs, have adversely affected reproduction, endocrine function, and immune function in seals inhabiting industrial coastal regions. The sensitivity of harbor seals to the effects of contaminants first gained widespread attention in 1988 when chemical immune suppression by PCBs was implicated in the virus-related deaths of 20,000 harbor seals in northwestern Europe. In 1979-80, an outbreak of type A influenza virus resulted in the deaths of more than 500 harbor seals along the US Atlantic coast. A possible role of environmental chemicals (*e.g.*, PCBs) in the outbreak was not investigated, although data from the 1970s indicated that PCBs and DDT levels in these seals were approaching the 100 ppm range.

Summary of Findings 2001-2003

MERI generated two years of data on levels and effects of environmental contaminants in harbor seals from the Gulf of Maine and along the US Atlantic coast. Tissues obtained from wild (free-ranging) and stranded seals were analyzed for POPs (PCBs, dioxins, furans, pesticides) and heavy metals including mercury.

- Free-ranging Gulf of Maine harbor seals exhibited high plasma levels of dioxin-like compounds (PCBs, dioxins and furans); levels in the adult seals were associated with significant changes in immune function.
- PCB levels in blubber of stranded Gulf of Maine harbor seals were also relatively high. In both free-ranging and stranded seals, the PCB-dioxin levels exceeded the proposed threshold levels in blubber for adverse effects on immune function in the species.
- DDT and chlordanes were moderately elevated in blubber of stranded harbor seals.
- Lead levels were elevated (mean 34 μg/g dry weight) in hair samples of free-ranging seals off Cape Cod, and copper levels were elevated in seals from Penobscot Bay, Maine, possibly reflecting local point-source inputs.
- Mercury levels in the livers of stranded adult harbor seals were extremely high (mean 93 μg/g, wet weight) and exceeded international action levels for liver injury in mammals. Mercury levels in seal hair were in the same concentration range as the 1973 levels reported in harbor seals from eastern Canada, suggesting continuing inputs of mercury in the food chain.

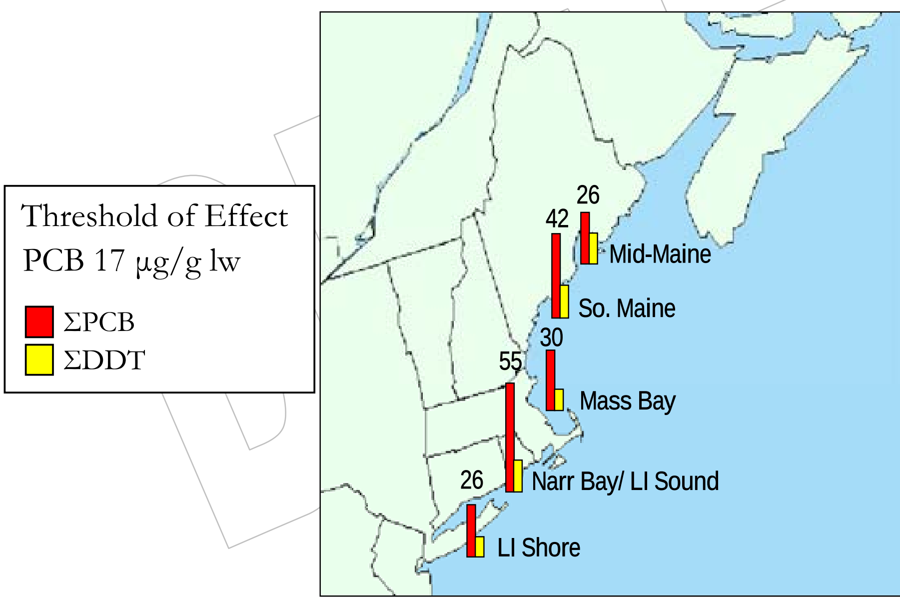

Figure 4-15 PCB and DDT concentrations (*u*g/g, lw) in blubber of harbor seals

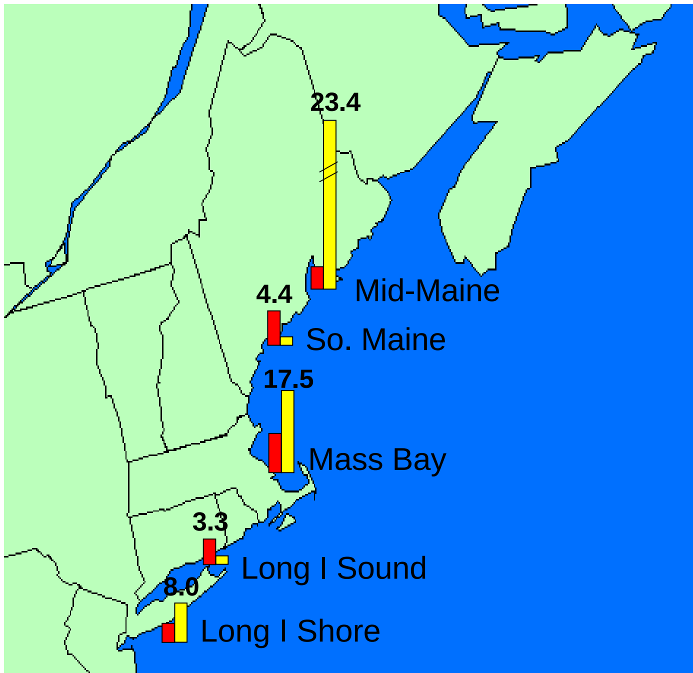

Figure 4-16 Mercury levels in liver (*u*g/g, ww - symbolized in yellow) and hair (*u*g/g, dw – symbolized in red) of harbor seals along the US Atlantic coast

These data suggest that harbor seals in the Gulf of Maine accumulate relatively high levels of environmental contaminants, levels that may place them at risk for adverse health effects. While preliminary, these are the first extensive data reported on persistent organic pollutants and heavy metals in Gulf of Maine seals in 25 years. Because of their high trophic status, harbor seals ultimately provide information on chemicals that present the greatest risk to consumers at the top of the food chain, including humans.

Aquatic Nuisance Species

Aquatic Nuisance Species (ANS) are aquatic species that have been introduced into ecosystems in the United States and the world and are having harmful impacts on the natural resources in these ecosystems. There is much interest recently in ANS but care should be taken to keep this interest in perspective. The DEP Marine Program will analyze the issue of ANS in context of the standards for classification of estuarine and marine waters (MSRA Title 38 Article 4-A).

There are a number of categories that the ANS species fit into:

1 - Old Time Invaders: These species were introduced years ago and have been integrated into the community for some time. Most of these species would not be considered ANS by DEP.

Green crab, Carcinus maenas, unknown north of Cape Cod in the 19^{th} century, now the most common shore crab.

Common periwinkle, Littorina littorea, the most common periwinkle on rocks and pilings along Maine's coast.

European oyster, Ostrea edulis, introduced to the Boothbay Harbor region of Maine by what is now National Marine Fisheries Service in the 1950's. There is a limited population in that area as well as Casco Bay.

2 - Species that are difficult to identify and have been largely ignored: tunicates, bryozoans, cnidaria (anenomes), porifera (sponges). Most of these species probably would not be ANS and are only considered new because little information exists on their historic distributions.

Membranipora, scattered among 4 or more families. DEP has many records for this and related families dating back to the late 1800's for Casco Bay. Membranipora membranacea was one of the "introduced" species identified in a recent (2003) rapid assessment survey in Casco Bay.

In the same survey, the list included two scale worms that can be found in almost every high energy rocky shore tide pool along the coast of Maine. Other cryptogenics listed in the same survey are from category 2 above (hard to identify and largely ignored).

3 - Periodic Drifters:

Shipworms, Teredo spp. Mostly found south of Maine but are carried into Maine on driftwood, a menace to pilings and wooden boats particularly in warm waters.

4 – Exotics:

Japanese shore crab, Hemigrapsis sanguineus, established in Deleware Bay in the 1980's and has now moved into Maine. This species would be considered an ANS because of the way it functions in the community that it invades.

Another species is being closely watched. There was one record of this wormlike species in Maine previously and now it is turning up in more places. It is premature to determine if this species would be considered in the ANS category. Also, it is unlikely that it is causing any real functional community damage.

5 - Other nuisance aquatics that may not be introduced but can cause economic damage:

Gribbles, Limnoria spp., small wood boringisopods found in pilings and driftwood in the lower intertidal and subtidal areas from Rhode Island north. There was a problem with gribbles in Eastport within the last ten years. Gribbles feed on a wood-dwelling fungus rather than the wood itself.

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Chapter 5 WETLANDS

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Section 5-1 BACKGROUND

Related Website: www.maine.gov/dep/blwq/wetlands/index.htm

Wetlands are among Maine's most diverse and valuable natural resources, comprising fully 25 percent of the State's surface area. There are over 5 million acres of freshwater wetlands in Maine, including forested and shrub swamps, bogs, freshwater meadows, marshes and floodplains. Tidal wetlands, such as flats, salt and brackish marshes, aquatic beds, bars and reefs make up about 157,500 acres. Wetlands perform numerous functions that are essential to both human society and the ecological balance of the natural world. Wetlands serve as natural water storage areas that help to decrease flood impacts by absorbing flows and reducing water velocity. They also play a vital role in maintaining lake, river and stream levels, and serve as hydrologic links between surface water and ground water aquifers. By trapping sediments and associated pollutants, wetlands often help to protect water quality, and also stabilize shoreline areas that would otherwise be vulnerable to erosion from wave action and currents. Wetlands support a vast array of fish and wildlife, including many endangered and commercially important species. In addition, Maine residents and visitors, through various recreational activities (such as sport fishing, hunting, canoeing, hiking and wildlife viewing), enjoy the aesthetic values of wetlands.

Federal Regulatory Framework

EPA Contact: Jeanne Voorhees, EPA Region I, Office of Ecosystem Protection

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Related Website: (EPA) www.epa.gov/owow/wetlands/regs/

ACE Contact: Ruth Ladd, ACE New England Region, Regulatory Division

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Related Website: (ACE) www.usace.army.mil/inet/functions/cw/cecwo/reg/index.htm

Lead Agencies: EPA Region I and the U.S. Army Corp of Engineers (ACE) – Maine Project Office

Under the Clean Water Act, wetlands are regulated as surface waters. The Clean Water Act provides for wetland protection and regulation through a number of federal programs, most of which are administered by EPA. The exception is the Section 404 regulatory program, which is jointly administered by EPA and the U.S. Army Corps of Engineers. The following sections of the Clean Water Act encompass key elements of the federal wetland protection framework:

- Section 303: Requires states to adopt water quality standards for all waters of the U.S. within their boundaries, including wetlands.

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- Section 305: Requires States to assess the condition of all waters of the U.S. within their boundaries, including wetlands, and to report to EPA every two years regarding attainment of State water quality standards.
- Section 319: Establishes a non-regulatory federal program that provides funding to states and tribes for the development and implementation of programs to reduce non-point sources of pollution, including non-point sources impacting wetlands.
- Section 401: Requires that prior to issuing a license or permit, federal agencies must obtain a written certification that an activity will not violate applicable State water quality standards, including wetland standards.
- Section 402: Establishes the National Pollutant Discharge Elimination System (NPDES) program that regulates point source discharges to waters of the U.S. including wetlands.
- Section 404: Authorizes a program to regulate the placement of dredged or fill materials into wetlands and other waters of the U.S. The 404 permit program is administered jointly by EPA and the U.S. Army Corps of Engineers. The Corps is responsible for issuing permits and for jurisdictional determinations. The Corps and EPA have shared responsibility for compliance and enforcement, and both may issue guidelines and policies.

Wetlands Regulatory Program in Organized Towns

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Related Website: (NRPA) www.maine.gov/dep/blwq/docstand/nrpapage.htm

Maine DEP regulates wetland alterations in the organized townships under the Natural Resources Protection Act 38 M.R.S.A., Section 480-A et seq. (NRPA) and Chapter 310 Wetlands and Waterbodies Protection Rules. The NRPA applies to regulated activities in, on or over any protected natural resource, including wetlands, and activities performed adjacent to certain resources that may cause soil or other material to wash into them. Under Section 480-C(2), activities requiring a permit include dredging, bulldozing, removing or displacing soil or vegetation, draining or dewatering, filling, and construction, repair or alteration of any permanent structure. The NRPA also contains a number of exemptions for activities listed in Section 480-Q. The Department uses a 3-tier review process to assess applications for wetland alterations, based on the size of the proposed alteration and the type of wetland involved.

Effective September 29, 1995, changes in the NRPA made it more consistent with the Federal Section 404 wetlands regulatory program. Chapter 310 rules were also amended accordingly, and became effective July 4, 1996. Concurrent with the revisions to the NRPA, the Army Corps of Engineers (ACE) instituted a Programmatic General Permit (PGP) for activities requiring Section 404 wetland alteration permits, with review thresholds comparable to those of the State's program. Maine DEP and ACE adopted a joint permit application form which is submitted to DEP to obtain both State and Federal permits, including Section 401 Water Quality Certification. While ACE issues a separate permit, DEP staff coordinate with the federal agencies on reviewing applications. Section 401 Water Quality Certification is issued concurrently with permits approved under the NRPA by DEP.

Wetlands Regulatory Program in Unorganized Territories

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The Maine Land Use Regulation Commission (LURC) utilizes a land use planning approach to regulate wetlands in unorganized portions of the State, in accordance with the provisions of Title 12, Sections 681-689 (Use Regulation) and Chapter 10 of LURC rules (Land Use Districts and Standards). Wetland alterations are often handled within the context of a building, development, shoreland alterations, or other type of permit. All areas within the jurisdiction are zoned as management, development or protection sub-districts. The Wetlands Protection Sub-district (P-WL) is used to regulate activities within wetlands. There are three different types of P-WL:

1) P-WL1 includes open water such as great ponds and rivers as well as other Wetlands of Special Significance;

2) P-WL2 includes scrub shrub and other non-forested freshwater wetlands, excluding those covered under P-WL1; and

3) P-WL3 includes forested freshwater wetlands, excluding those covered under P-WL1 and P-WL2

LURC regulates mapped wetlands based on the National Wetlands Inventory. In general, all mapped wetlands are regulated, and unmapped wetlands are not regulated unless wetland delineation is required. The exceptions to this are:

- Streams draining 50 square miles or less (some are mapped, some are not, but all are regulated); and
- Projects disturbing more than one acre of land (either wetland or upland) require all wetlands in the project area to be delineated, with all identified wetlands becoming jurisdictional

Section 10.16(K)(3) of Chapter 10 rules details uses requiring a permit, and prohibits all uses not expressly allowed under this section. Permitting is based on a three-tiered system similar to the Natural Resources Protection Act. The thresholds for the level of tier review are tied to the size of the wetland impact and the type of wetland.

Section 5-2 Development of Wetland Water Quality Standards

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Federal Requirements

Related Websites: (EPA)

(Wetland Water Quality) www.epa.gov/owow/wetlands/regs/quality.html

(General Water Quality Standards) www.epa.gov/ost/standards/

Under Section 303(c) of the Clean Water Act, States are required to develop water quality standards for all "waters of the U.S.", including wetlands. In 1990, EPA

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published national guidance for implementing wetland water quality standards[2] that addresses the following elements:

- Include wetlands in the definition of "State Waters";
- Designate uses for all wetlands that protect wetland structure and function;
- Adopt aesthetic narrative criteria and numeric criteria to protect wetland-designated uses;
- Adopt narrative biological criteria for wetlands; and
- Apply the State's anti-degradation policy and implementation methods to wetlands

Similar to other water bodies, designated uses for wetlands must, at a minimum, provide for the protection of fish, shellfish, wildlife, and recreation. Effective in 1987, Section 303(c)(2)(B) requires States to adopt numeric criteria for toxic pollutants for which EPA has published criteria. This section further requires that, where numeric criteria are not available, States should adopt criteria based on biological monitoring and assessment methods. States must also adopt nutrient criteria for all waters, including wetlands.

Status of Wetland Water Quality Standards in Maine

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Inclusion of Wetlands as State Waters

Wetlands are encompassed in the following definition under the Protection and Improvement of Waters Act, 38 M.R.S.A. Section 361-A(7):

> *"Waters of the State" means any and all surface and subsurface waters that are contained within, flow through, or under or border upon this State or any portion of the State, including the marginal and high seas, except such waters as are confined and retained completely upon the property of one person and do not drain into or connect with any other waters of the State, but not excluding waters susceptible to use in interstate or foreign commerce, or whose use, degradation or destruction would affect interstate or foreign commerce.*

Wetland Designated Uses and Criteria

Maine does not have wetland-specific designated uses or criteria. To implement water quality standards for wetlands, wetland management classes must be defined, and associated uses and criteria applied. Where appropriate, existing water quality standards for fresh surface waters and estuarine and marine waters (described in Maine's Water Classification Law) may be applied to wetlands. Existing standards, including designated uses and narrative criteria are largely applicable to wetlands, provided wetland-specific assessment methods are used to determine attainment status. The Maine Water Classification Law provides for flexibility where specific uses or criteria may not be suitable.

Biological criteria are expected to be especially useful for evaluating wetland condition. A major goal of the Maine DEP Biological Monitoring Program is to develop

[2] U.S. EPA. 1990. Water Quality Standards for Wetlands: National Guidance. Office of Water, Regulations and Standards, U.S. Environmental Protection Agency, Washington D.C. EPA 440/S-90-011.

wetland-specific biological criteria and incorporate them into State water quality standards. Development of biological criteria for wetlands is a priority in DEP's Performance Partnership Agreement with EPA, and is also addressed in the Maine Wetland Conservation Plan.

In response to EPA's requirement to develop nutrient criteria for all waters, Maine DEP has completed a Nutrient Criteria Adoption Plan which includes wetlands. Maine plans to develop nutrient criteria based on biological response indicators. Approaches being considered include the use of algal and vegetative indicators of wetland nutrient enrichment. DEP will also explore the use of nutrient concentration thresholds as appropriate for specific wetland classes.

Development of wetland-specific criteria requires collecting additional data statewide to establish reference conditions and biological impairment thresholds for multiple biological assemblages and wetland types. To date, there has been little or no standardized biological monitoring of wetlands in many regions of the State. Although DEP has made significant progress by establishing a wetland biological monitoring program, developing comprehensive numeric biocriteria for wetlands will require a substantial investment of time, staff and other resources.

Application of Maine's Anti-degradation Policy to Wetlands

Section 464(4)(F) of Maine's Water Classification Program (Title 38, Section 464 et seq.) describes the State's anti-degradation policy. According to EPA's water quality standards guidance, the anti-degradation policy should automatically apply to wetlands since they are defined as waters of the State.

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Section 5-3 INTEGRITY OF WETLAND RESOURCES

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Incorporating Wetlands into Maine's Biological Monitoring Program

Related Website: www.maine.gov/dep/blwq/wetlands/monitoring.htm

The Maine DEP Biological Monitoring Program is part of the Division of Environmental Assessment. The program was formally established in 1983, and has extensive experience in water quality monitoring and assessment, data management and biocriteria development. The Biological Monitoring Program provides water quality information for a wide array of programs and initiatives including ambient monitoring and trend analysis, evaluation of water quality classification attainment, and assessment of impacts from point discharges, non-point sources, land use practices, toxic contamination and hydropower activities. In 1998, Maine DEP began development of biological monitoring and assessment methods for freshwater wetlands. DEP initially conducted a pilot study in the Casco Bay watershed, located in southern Maine. Beginning in 2001, DEP expanded wetland monitoring to additional major watersheds in the state, and plans to extend monitoring to remaining regions over the next several years.

The Maine wetland biomonitoring initiative has been incorporated into DEP's Biological Monitoring Program. This has been an efficient way to pool limited resources in areas such as staff support, equipment purchases, and contract management. This strategy has also allowed DEP to build on the experience of Maine's river and stream biomonitoring program. Wetlands, rivers and streams in the same watershed are usually hydrologically and/or ecologically connected, and causes of biological degradation are often the same for different waterbody types. The Maine Biological Monitoring Program has established a goal to move toward a comprehensive watershed perspective in collecting and interpreting wetland and stream data. Wetland biomonitoring is currently coordinated with the State's river and stream biomonitoring using the following 5-year rotating basin schedule:

DEP Five Year Basin Monitoring Schedule Rotation

St. John Watershed	2004
Presumpscot, Saco, Southern Coastal Watersheds	2005
Penobscot, Downeast Watersheds	2006
Kennebec, Mid-Coast Watersheds	2007
Androscoggin Watershed	2008

Locations of the major drainage basins are shown in Figure 5-1 along with wetland monitoring stations where biomonitoring data have previously been collected.

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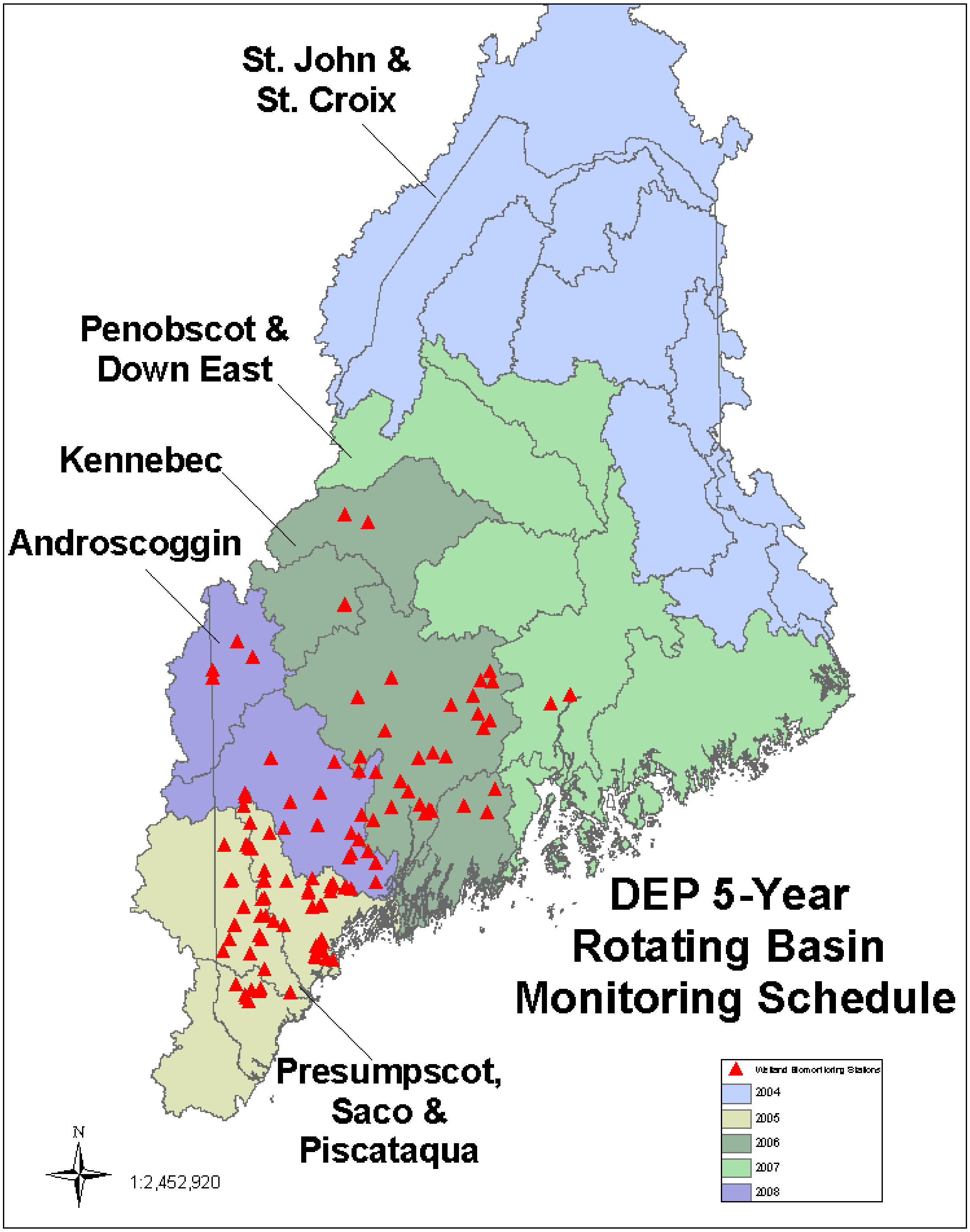

Figure 5-1 DEP 5-Year Rotating Basin Monitoring Schedule and Wetland Biomonitoring Stations.

The DEP Biomonitoring Program currently focuses on semi-permanently or permanently inundated wetlands (i.e. sites having standing water most of the time except during unusually dry periods). These include palustrine, riverine fringe and lacustrine wetlands, many of which are closely associated with other surface water bodies. Wetlands are targeted on a watershed basis to encompass a range of human disturbance, from known poor-quality sites to potential reference (minimally-disturbed) wetlands. This approach was selected to facilitate testing and refinement of biological metrics throughout the state. Additional sites may be targeted to address specific regulatory or management concerns.

DEP assesses aquatic macroinvertebrates as the primary taxonomic indicator group for wetlands. The Biomonitoring Program also plans to develop algal and vegetative indicators of wetland condition, as resources to do so become available. To successfully implement a comprehensive biological monitoring program for wetlands, DEP needs to build the capacity to assess multiple biological assemblages. This is necessary because various groups of organisms differ in their sensitivity as indicators, depending on the type of wetland and the environmental stressors involved. The ability to assess additional assemblages will allow DEP to monitor different wetland types and evaluate impacts from a wider range of human activities. It will also help the Biomonitoring Program to address increasing requests from other wetland-related programs for technical support and guidance related to wetland impact assessment and water quality criteria.

Overall program goals for wetland monitoring and assessment include:

- To evaluate the ecological integrity of wetlands in the State and identify significant trends in wetland condition
- To enhance the State's ability to predict and assess risks to wetlands from human activities
- To improve management and regulatory strategies to protect and restore wetland ecological integrity
- To heighten public awareness about the ecological importance of wetlands, the threats to wetland health and protection measures

Recent Biomonitoring Program activities which support these goals for wetlands include:

- Development of Microsoft Access wetland assessment database (uploadable to EPA's STORET database)
- Completion of nutrient criteria adoption plan including wetlands
- Development of wetlands web pages on the Maine DEP web site
- Development of an Internet Mapping Project to provide public access to biomonitoring program data for wetlands, rivers and streams (in progress)
- Incorporation of wetlands into DEP's water quality monitoring strategy (in progress)
- Implementation of STORET database for State wetland biomonitoring data (in progress)
- Development of landscape-level assessment tool to predict threats to wetlands and other waters (in progress)
- Ongoing participation in wetland assessment and policy work groups (Maine Wetland Interagency Team, EPA National Wetland Monitoring and Assessment Work Group, the New England Biological Assessment of Wetlands Work Group, and the New England Interstate Water Pollution Control Commission wetlands work group).
- Ongoing participation in professional organizations related to wetlands, including presentations at scientific and technical meetings (Maine Association of Wetland Scientists, New England Association of Environmental Biologists, Association of State Wetland Managers, Society of Wetland Scientists, North American Benthological Society).

Biological Criteria Development Using Macroinvertebrate Indicators

To date, DEP has conducted wetland biomonitoring at 112 different sites throughout the southern half of the state (Figure 5-2). Results for macroinvertebrate samples, water samples, field measurements and information related to habitat and human impacts are entered into an ACCESS database. The database has the capability to automatically calculate over 100 invertebrate community attributes that have been tested for use as metrics/indicators of wetland condition. Candidate metrics are selected based on their response to human disturbances that may adversely affect wetland health, and include measures of taxa richness, relative abundance, tolerant/intolerant taxa, dominant taxa, diversity and trophic structure. Examples of candidate metrics plotted in relation to human disturbance appear in Figures 5-2 and 5-3.

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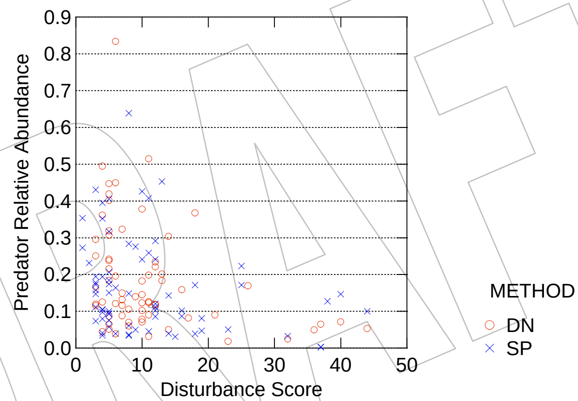

Figure 5-2 Relative Abundance of Predator Taxa in Relation to Human Disturbance

"Method" denotes invertebrate sample collection method, i.e. D-frame net (DN) or stovepipe sampler (SP). Disturbance score increases with the amount of human alteration in the wetland or surrounding watershed.

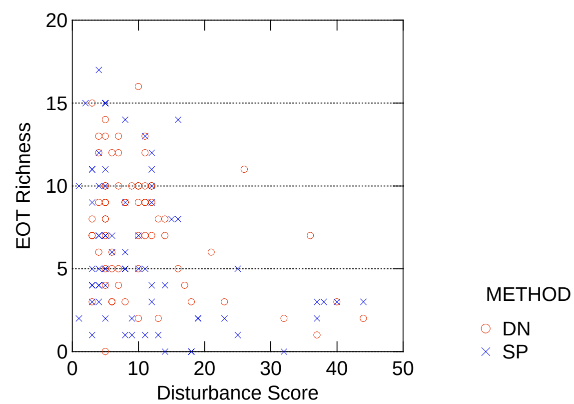

Figure 5-3 Taxa Richness for Mayflies, Dragonflies and Caddisflies in Relation to Human Disturbance

"EOT" denotes total Ephemeroptera (Mayfly), Odonata (Dragonfly/Damselfly) and Trichoptera (Caddisfly) taxa.
"Method" denotes invertebrate sample collection method, i.e. D-frame net (DN) or stovepipe sampler (SP).
Disturbance score increases with the amount of human alteration in the wetland or surrounding watershed.

The Biomonitoring Program is developing thresholds to describe incremental levels of wetland impairment for aquatic macroinvertebrate communities. This is necessary to enable the State to use biological monitoring data in regulatory and management decisions, develop wetland-specific biological criteria, and report on wetland condition with respect to water quality criteria. As part of this process, candidate reference sites were selected to document the range of natural conditions expected to occur in unimpaired wetland communities. Figure 5-4 illustrates comparisons of reference wetlands and highly disturbed sites for selected invertebrate metrics.

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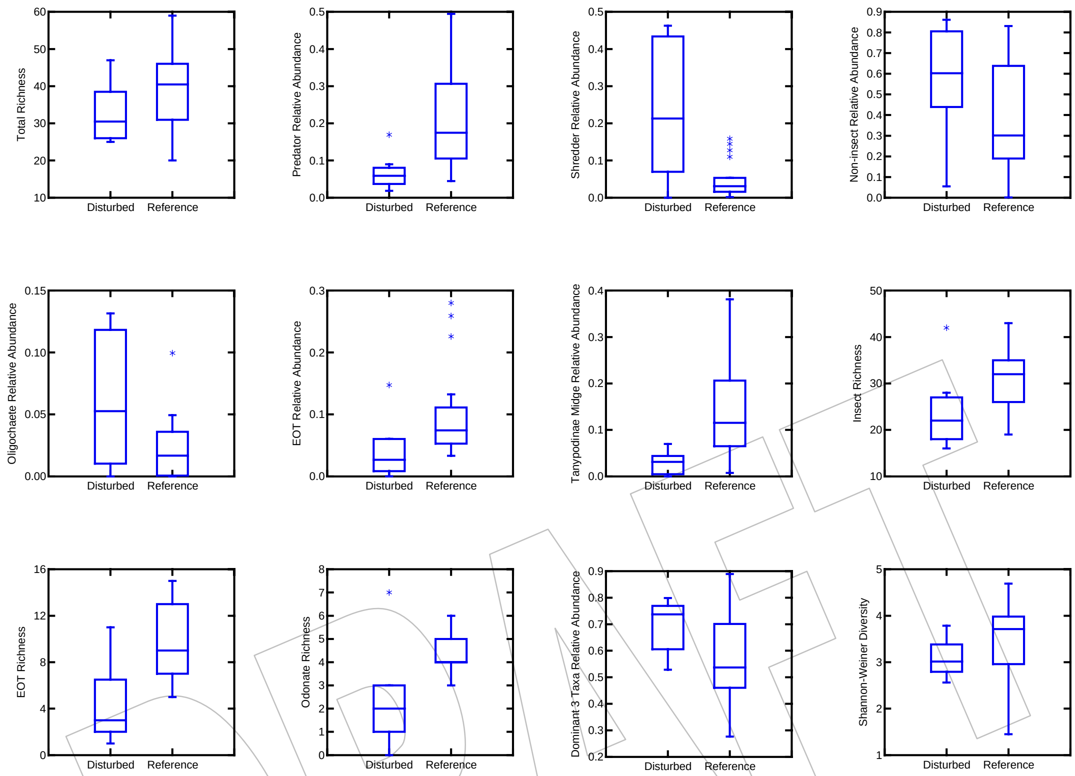

Figure 5-4 Comparison of Selected Wetland Invertebrate Metrics for Reference and Disturbed Sites (D-frame Net Samples)

"EOT" denotes total Ephemeroptera (Mayfly), Odonata (Dragonfly/Damselfly) and Trichoptera (Caddisfly) taxa.

The Biomonitoring Program will continue to refine candidate metrics and reference criteria to incorporate new data and identify modifications that may be needed to address habitat and classification issues. During 2004, the Biomonitoring Program plans to establish draft criteria for designating biologically impaired wetlands using a tiered approach which may be linked to aquatic life uses.

Section 5-4 EXTENT OF WETLAND RESOURCES

Wetland Loss Tracking in Maine's Organized Towns

Contact: Mike Mullen, DEP BLWQ, Division of Land Resource Regulation

Tel: (207) 287-4728 email: Mike.Mullen@maine.gov

Related Website: www.maine.gov/dep/blwq/wetlands/threats.htm

With the implementation of the changes to the Natural Resources Protection Act (NRPA), Maine DEP is now tracking permitted wetland losses and mitigation in the organized townships through an application tracking system. When applications for freshwater wetland alterations are logged in, the amount of fill or area to be altered is also entered and tracked by wetland type and geographical location. This system will enable the Department to monitor and report on annual wetland losses. Wetland mitigation and DEP permitted impacts for 2002 and 2003 are summarized in Tables 5-1 and 5-2 below.

Table 5-1 Wetland Mitigation Totals in the Organized Towns

Source: Maine DEP Wetland Loss Tracking System

Area of Mitigation (Acres) – 2002 (1/1/2002-12/31/2002)					
Wetland Type	**Creation**	**Enhancement**	**Preservation**	**Restoration**	**Total**
Forested	0.34	0	15.2	0.75	**16.29**
Other/Mixed	1.28	0.52	26.26	0.13	**28.19**
Emergent	0.25	0.86	0	0	**1.11**
Scrub-shrub	0.19	0.5	5.58	0	**6.27**
Open water	0.08	0	0.05	0	**0.13**
Riverine	0	0.06	0	0	**0.06**
Wet Meadow	0	0	0	10.0	**10.0**
Upland	0	0.14	160.01	0	**160.15**
Intertidal (other)	0	0	0.2	0	**0.02**
Subtidal (other)	0	0	0	0.93	**0.93**
Total	**2.14**	**2.07**	**207.3**	**11.82**	**223.33**

Area of Mitigation (Acres) – 2003 (1/1/2003-12/31/2003)					
Wetland Type	**Creation**	**Enhancement**	**Preservation**	**Restoration**	**Total**
Forested	1.89	11.65	210.62	1.08	**225.24**
Other/Mixed	0	0	0	0	**0.0**
Scrub-shrub	9.1	0.98	27.44	2.75	**40.27**
Open water	0	0	0	0	**0.0**
Riverine	0	0	1.73	0	**1.73**
Wet Meadow	0	1.0	0	0.4	**1.4**
Upland	0	0	0	0	**0.0**
Intertidal (other)	0	0.07	0	0	**0.07**
Subtidal (other)	0	0.06	0	0	**0.06**
Total	**10.99**	**13.77**	**239.78**	**4.23**	**268.77**

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Table 5-2 Permitted Wetland Impacts in the Organized Towns

Source: Maine DEP Wetland Loss Tracking System

Area Impacted (Acres) – 2002 (1/1/2002-12/31/2002)										
Wetland Type	**Cranberry Permit**		**Full NRPA Permit**		**Tier I**		**Tier II**		**Total**	
	Filled	**Altered**	**Filled**	**Altered**	**Filled**	**Altered**	**Filled**	**Altered**	**Filled**	**Altered**
Emergent	0	0	5.82	0	0.22	0.28	0.32	0	**6.37**	**0.28**
Forested	0	0	5.84	0	10.26	1.27	2.37	0.84	**18.47**	**2.11**
Great Pond	X	X	0	0.02	X	X	X	X	**0.0**	**0.02**
Intertidal (mudflat)	X	X	0.01	0.04	X	X	X	X	**0.01**	**0.04**
Intertidal (other)	X	X	0.19	0.31	X	X	X	X	**0.19**	**0.31**
Intertidal (vegetated)	X	X	0.02	0	X	X	X	X	**0.02**	**0.0**
Open Water	0	0	0.01	7.9	0.21	0	0	0	**0.22**	**7.9**
Other/Mixed	0	0	0.13	0.13	3.21	0.06	3.59	0	**6.93**	**0.19**
Peatland	0	0	0	0	0	0	0	0	**0.0**	**0.0**
Riverine	X	X	0.68	0.02	0.06	0	0	0	**0.68**	**0.02**
Scrub-shrub	0	0	3.03	0.7	2.73	0.13	1.71	0	**7.47**	**0.84**
Subtidal (aquatic bed)	X	X	0	1.4	X	X	X	X	**0.0**	**1.4**
Subtidal (other)	X	X	16.0*	71.96	X	X	X	X	**16.0**	**71.96**
Wet Meadow	0	0	0	0	3.08	0	0.63	0	**3.71**	**0.0**
Upland	0	0	0.07	0	0	0	0	0	**0.07**	**0.0**
Total	**0.0**	**0.0**	**31.81**	**82.49**	**19.71**	**1.74**	**8.63**	**0.84**	**60.15**	**85.07**

X = Tier review not available for projects located in these resources

***** area impacted by dredge spoils disposal

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Table 5-2 Permitted Wetland Impacts in the Organized Towns (continued)

Area Impacted (Acres) – 2003 (1/1/2003-12/31/2003)										
Wetland Type	**Cranberry permit**		**Full NRPA permit**		**Tier I**		**Tier II**		**Total**	
	Filled	**Altered**	**Filled**	**Altered**	**Filled**	**Altered**	**Filled**	**Altered**	**Filled**	**Altered**
Emergent	0	0	0.96	0	0.35	0	0	0	**1.31**	**0.0**
Forested	0	0	11.56	15.7	11.7	0.59	3.78	0	**27.06**	**16.3**
Great Pond	X	X	0.01	0	X	X	X	x	**0.01**	**0.0**
Intertidal (mudflat)	X	X	0.01	0.01	X	X	X	x	**0.01**	**0.01**
Intertidal (other)	X	X	0.43	0.61	X	X	X	x	**0.43**	**0.61**
Intertidal (vegetated)	X	X	0.05	0.2	X	X	X	x	**0.05**	**0.2**
Open water	0	0	0	0.07	0	0	0	0	**0.00**	**0.07**
Other/Mixed	0	0	0.53	0.29	2.3	0	0	0	**2.83**	**0.29**
Riverine	X	X	1.5	0.11	0	0	0	0	**1.5**	**0.11**
Scrub-shrub	0	0	0.98	0.74	3.63	0.27	1.67	0	**6.28**	**1.01**
Subtidal (aquatic bed)	X	X	0	0.55	X	X	X	x	**0.0**	**0.55**
Subtidal (other)	X	X	0.04	0.35	X	X	X	x	**0.04**	**0.35**
Wet Meadow	0	0	1.39	5.63	1.61	0	1.25	0	**4.24**	**5.63**
Upland	0	0	0.01	0	0	0	0	0.45	**0.01**	**0.45**
Total	**0.0**	**0.0**	**17.47**	**24.26**	**19.6**	**0.87**	**6.7**	**0.45**	**43.77**	**25.58**

X = Tier review not available for projects located in these resources

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Wetland Loss Tracking in Maine's Unorganized Territories

Contact: Marcia Spencer-Famous, Senior Planner, DOC LURC, Planning & Administration Division

Tel: (207) 287-4933 email: Marcia.Spencer-Famous@maine.gov

On January 5, 2004, the Maine Land Use Regulation Commission's (LURC) new Geographically Oriented Action Tracker (GOAT) system went on-line. This new database is much more powerful that our previous system, and has allowed the incorporation of our wetlands loss tracking database into LURC's overall data tracking system. Previously, wetland loss data were kept in a separate database. This change will facilitate two improvements. First, in addition to the wetlands loss data that have previously been gathered, such as wetland type, size of area lost, etc, GOAT will now allow the wetland loss to be tied to the tax lot using GIS. Second, it will increase data collection consistency because it is now a part of LURC's larger permit tracking system rather than being a separate database. Because of staff and management attrition and budget cuts, wetlands loss tracking up until now has been inconsistent, making reporting of losses for 2003 less than complete. LURC now anticipates in coming years to be able to generate realistic reports on wetland losses in the State's unorganized townships and territories.

Section 5-5 ADDITIONAL WETLAND PROTECTION ACTIVITIES

Support for the following activities was provided by a federal Clean Water Act Section 104(b)(3) Wetland Program Development Grant, which was awarded to Maine DEP through its Performance Partnership Agreement with EPA Region I:

Beginning with Habitat: An Approach to Conserving Open Space

Contact: Molly Docherty, DOC BGNA, Natural Areas Program

Tel: (207) 287-8045 email: Molly.Docherty@maine.gov

Related Website: www.beginningwithhabitat.org

Lead Agencies: Maine Natural Areas Program (MNAP), Maine Department of Inland Fisheries & Wildlife (MDIFW), and The Maine Audubon Society (funded in FY02 and FY03)

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This project is a cooperative effort bringing together State, federal and private non-profit sectors to assist communities with land use planning for natural resource conservation. The project goal is to conserve high value wildlife habitat by incorporating the best available natural resource information into local planning efforts. The project uses a landscape-based approach that integrates data on shoreland zones, wetlands, habitats of special management concern, and a fragmentation analysis of the landscape. These data come from a U.S. Fish and Wildlife Service predictive habitat model, MDIFW rare species inventories, MNAP rare plant and natural communities' inventories, a wetland characterization model developed by the State Planning office, and remote sensing data.

A map set is individually tailored for and provided to each town, along with technical assistance materials to help with land use, comprehensive and open space planning efforts. The Beginning with Habitat project presents these materials to town planners in public forums, along with an educational presentation developed by the Maine Audubon Society on the effects of development on wildlife habitat loss and fragmentation. During 2002 and 2003, maps with associated educational materials and digital data were made available to 58 towns, and presentations were made in 42 towns. An improved website for the project is under development, which will provide an efficient delivery system for maps and other planning information to towns and the general public.

An Ecological Assessment of Aroostook Hills and Lowlands

Contact: Molly Docherty, DOC BGNA, Natural Areas Program

Tel: (207) 287-8045 email: Molly.Docherty@maine.gov

Related Website:

www.maine.gov/doc/nrimc/mnap/programs/inventories.html#Aroostook

Lead Agency: Maine Natural Areas Program (MNAP) (funded in FY02 and FY03)

The goal of this project is to identify undocumented ecologically significant sites within a 2.5 million-acre area in the northeastern corner of the State, including most of eastern Aroostook County and the northern third of Penobscot county. The project will also update and collect data on known sites that may be poorly documented or out of date. The Maine Natural Areas Program administers surveys for rare plants and exemplary natural communities, and the Maine Department of Inland Fisheries and Wildlife administers surveys for rare animals. During the 2002 and 2003 field seasons, MNAP staff surveyed 43 sites. Preliminary results include the identification of 31 new natural community/ecosystem occurrences, and 28 new rare plant populations. Plans for the completion of the project include a final field season in 2004, to be followed by data compilation, landowner follow up and completion of a final report in March 2005.

Wetlands Characterization

Contact: Elizabeth Hertz, State Planning Office, Coastal Program

Tel: (207) 287-8935 email: Elizabeth.Hertz@maine.gov

Related Website (mapping): http://megisims.state.me.us/website/spowetc/viewer.htm

Lead Agency: Maine State Planning Office (SPO) (funded in FY03)

The Wetlands Characterization was developed as a rapid, flexible method to describe wetland functions in a landscape context useful for a variety of planning applications. The development of the Characterization resulted from recommendations made by the State Wetlands Conservation Task Force and identified in the State Wetlands Conservation Plan. The goal of this project was to investigate the inclusion of additional data layers and queries, and rerun the Characterization based upon updated data to insure that it reflects the most accurate assessment of wetlands at the State level. The results of the analysis will be made available to towns, land trusts, and watershed associations through the Beginning with Habitat Program, MeGIS, and an interactive mapping service.

The Wetlands Characterization will help provide full protection for Maine's priority wetland systems, increase the knowledge base about Maine's wetlands for use at all levels of protection, and promote the appreciation, stewardship, and voluntary protection of Maine's wetland resources by private landowners, towns, and non-governmental entities.

Statewide Atlas and Conservation Assessment of Maine's Damselflies and Dragonflies

Contact: Philip deMaynadier, IF&W BRM, Endangered Species Group

Tel: (207) 941-4239 email: Phillip.deMaynadier@maine.gov

Related Website: http://mdds.umf.maine.edu/

Lead Agency: Maine Department of Inland Fisheries and Wildlife (MDIFW) (funded in FY03)

Section 104(b)(3) funding was provided to complete MDIFW's Maine Damselfly and Dragonfly Survey, and to publish a statewide atlas and conservation assessment of Maine's diverse damselfly and dragonfly fauna. This project will help to prioritize protection efforts by disseminating information on the distribution and wetland-type preferences of the state's rarest odonates. Potential users include state agencies, environmental consultants, landowners, land trusts, environmental groups, and the general public. This publication will summarize seven years of data collection and life history study on Maine's 163 species of damselflies and dragonflies.

Invasive Plant Awareness Campaign

Contact: Molly Docherty, DOC BGNA, Natural Areas Program

Tel: (207) 287-8045 email: Molly.Docherty@maine.gov

Related Website: www.maine.gov/doc/nrimc/mnap/programs/invasives.html

Lead Agency: Maine Natural Areas Program (MNAP) (funded in FY03)

Invasive species continue to spread into Maine's wetlands and waterways. The ramifications for our wetland systems are habitat degradation and loss of native species diversity. Some of Maine's wetlands have already been degraded by invasive plants, but many aggressive invaders have not yet reached Maine. Preventing the arrival of some of these species will depend on increasing public awareness of the invasives problem.

Goals of the invasive plant awareness campaign are to: 1) Raise the profile of the invasives problem through presentations and displays at garden shows and state fairs; 2) Create educational materials or programs on invasive plant species suitable for use in schools, parks, nature centers, camps and other educational settings; 3) Provide presentations and materials on the threat of invasive plants to watershed groups; and 4) Develop a display promoting the value of native aquatic plants for use at annual milfoil summits and aquatic invasive events.

Local Conservation of Significant Vernal Pools

Contact: Sally Stockwell, Maine Audubon Society

Tel: (207) 781-2330 email: sstockwell@maineaudubon.org

Related Website: www.maineaudubon.org/resource/index.shtml

Lead Organization: Maine Audubon Society (funded in FY02)

This project will increase the protection of significant vernal pools in southern Maine that are most likely to fall victim to urban sprawl. Maine Audubon will apply Best Development and Planning Practices by working with at least two towns to inventory pools, assess their relative conservation values, and develop vernal pool conservation plans. This project is designed to build on work conducted by a University of Maine Ph.D. student on vernal pool landscape issues in Kennebunkport, North Berwick and Biddeford.

The Town of Falmouth has completed an inventory of vernal pools with assistance from Maine Audubon and the University of Maine. Potential vernal pools were identified using aerial photographs, and 98 pools were surveyed by volunteers. Each vernal pool was then ranked for its conservation value. Work on a vernal pool conservation plan for Falmouth is currently underway. The Town of Kennebunkport also plans to begin work on a vernal pool survey for 2004.

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